ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

Isn't it curious how a horse increases in value after it has met and been conquered by an electric current?

If you are passing Manhattan Field on any Tuesday or Thursday evening, step inside the gate and you will see the foot-ball team of the Manhattan Athletic Club practising. Rushes, tackles, wedges and scrimmages are gone through with when other foot-ballists are in bed. Forty arc lights make this possible.

A certain telephone company in the East is very proud of its subway construction, the manholes being especially well built and roomy. While some work was going on in a manhole, of which the cover was removed, a horse fell into it. The foreman of construction was present and listened to the threats of the horse owner with equanimity. After persuading him to calmness he assured him that he would receive justice at the hands of the telephone company. The president of the company was out of town and not wishing to assume too great a responsibility, the foreman wired the president, "Got a horse in a manhole. What shall I do?" In short order the reply came back, "Buy the horse before a lawyer gets there."

The foreman then approached the owner of the horse and said, "What'll you take for him?"

"Don't want to sell him," said the man.

"He's no good to you down there."

"I'll sue the company for him, then."

"Come now, what's he worth."

"Two hundred dollars."

"I'll give you a hundred for him."

"Nop."

To make the tale short the foreman finally bought the animal for $120 and got a quit claim for damages against the company with the horse.

Then the foreman rigged up a tackle, got the horse out all right, kept him three days, and sold him for $250.

That foreman's salary should have been raised.

This did not Happen on Broadway, but it May.

The carnival of the Priests of Pallas, held last week at Kansas City, Mo., was marred by an accident at Tenth and Main streets, where thousands of people were assembled to witness the parade. A Tenth street cable car became unmanageable and ran through the crowd. Sergeant George Burnett, of Troop I, First Cavalry, from Fort Leavenworth, had his left side crushed, and James Marshall, a negro, sustained a fatal fracture of the skull; Richard Woolen, ordnance sergeant, Troop I, First Cavalry, Fort Leavenworth, had his right leg broken; Private A. E. Lewis, of the same troop, had his shoulder fractured, and Corporal Norlan, of the same troop, received serious internal injuries; Mrs. Pierce had her right arm broken, and 20 others were more or less seriously injured.

The Light that Failed Temporarily.

The electric car was full and a certain young man was forced to sit quite close to the young woman who was with him, and this was all very agreeable to him. When the cars go under the railroad bridge on entering Hallowell from Augusta, it is customary to pull down the trolley and in the evening the lamps, as a consequence, go out. What an opportune time! Click went the trolley back to the overhead wire, the lamps glowed once again, and the passengers got their eyes accustomed to change of light just in time to see the lips of that young man and woman glued together. They, the blushing couple, were very glad to step off the car at the next street.—*Lewiston Evening Journal.*

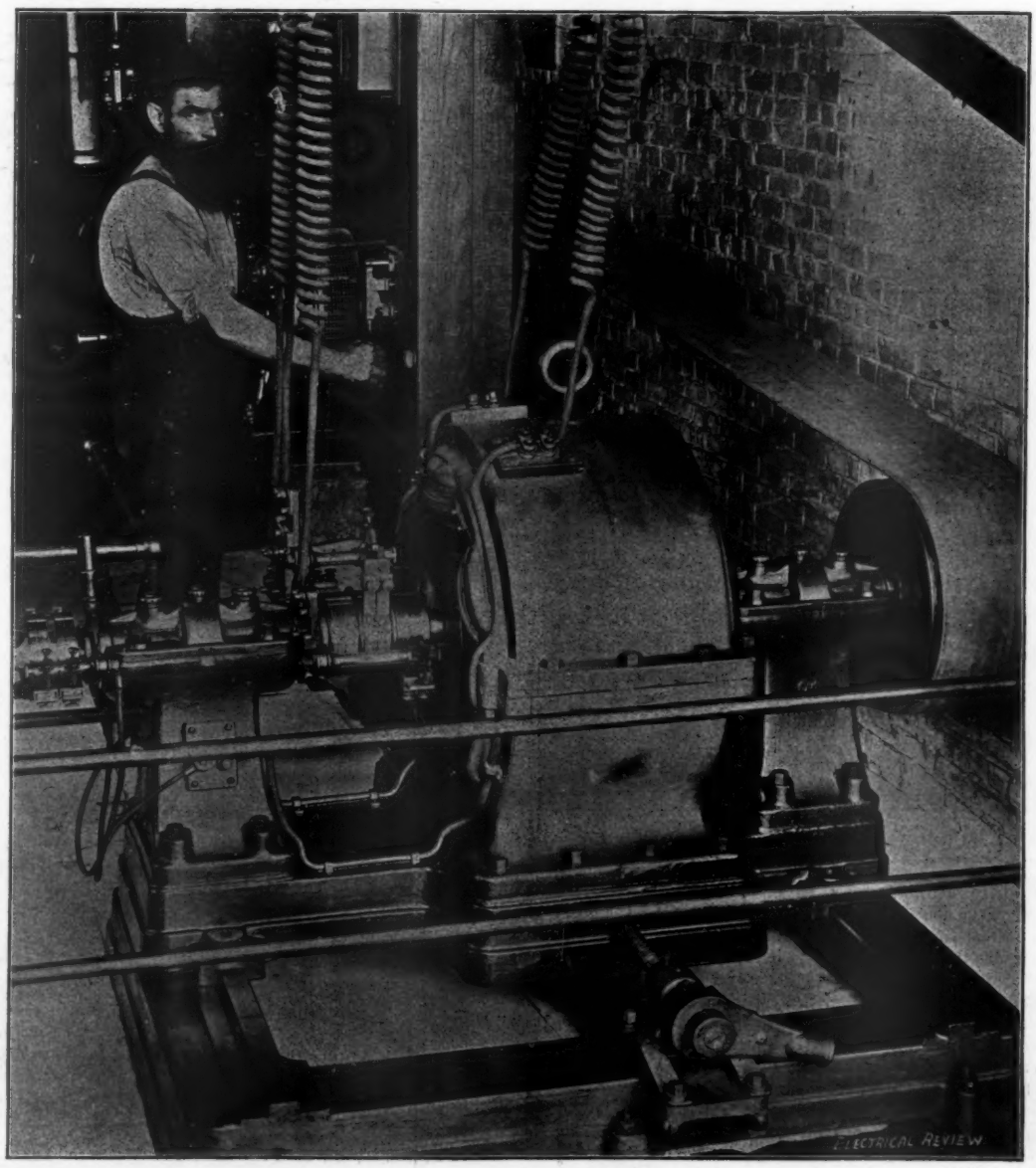

FIG. 1.—ELECTRIC WELDING AT THE OKONITE COMPANY'S FACTORY, PASSAIC, N. J.—VIEW OF THOMSON-HOUSTON GENERATOR.

Electric Welding in an Insulated Wire Factory.

THE OKONITE COMPANY'S ELECTRIC WELDING PLANT AT PASSAIC, N. J.

One of the first electric welding plants installed by the Thomson Electric Welding Company, of Boston, was that at the large wire manufactory of the International Okonite Company, at Passaic, N. J. The original plant consisted of one generator and two small welders, one for copper and one for iron sheathing wire. The plant was so successful that almost immediately after its installation the company decided to completely abolish the old method of hand splicing, which, even in the hands of skilled workmen, is a tedious and crude process as compared with electric welding.

The present plant consists of one 30,000 watt self-exciting constant potential Thomson-Houston alternator belted directly to a Ball automatic engine. The engine has extra heavy fly-wheels in order to maintain constant speed during sudden demands on the generator. The welders consist of one for iron armoring or sheathing wires, two for copper wire from No. 6 to No. 20 A. W. G., and two for copper wire from one-half inch in diameter to No. 6. For small wires the process of welding consumes but a very short time, the larger wires consume but little more time. One of the principal advantages of this method of welding wire is that wire which is already insulated can be welded by removing enough of the insulation to clamp the abutting ends. The average daily output of copper at the Okonite factory is five tons, and the welding machines are called upon to make about 200 welds. The welders are situated in different parts of the factory, and as the plant is run to its full capacity, there is very often simultaneous welding on all of the welders, making sudden and heavy demands upon the generator.

Of course, the different size wires require different projections of abutted pieces, dif-

ferent current strengths, different pressures on the abutted pieces, and the current must be interrupted at the proper time. But in spite of these facts, it requires no extra amount of skill on the part of the operator to make a perfect weld. By means of a table which has been previously worked out, the amount of end pressure on the abutted pieces is determined. The current strength for each wire is varied by moving the shield on the reactive shield placed near the welder.

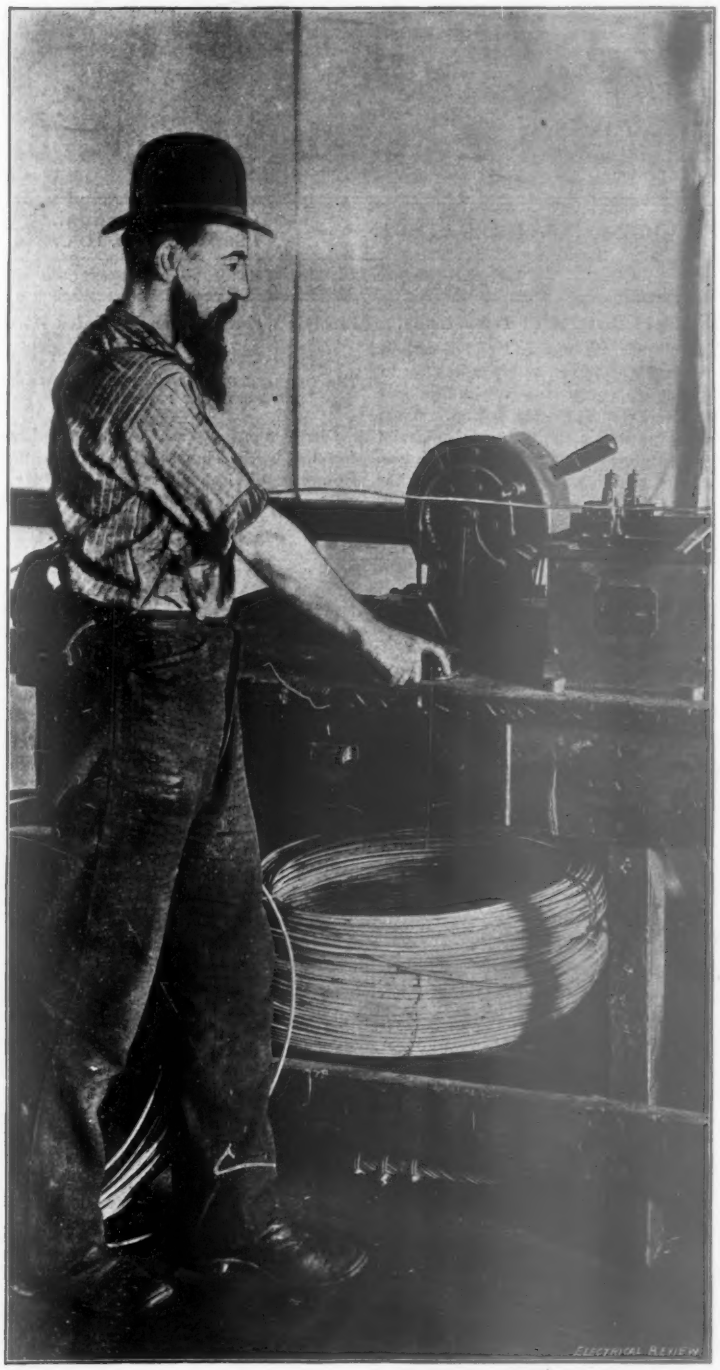

FIG. 2.—ELECTRIC WELDING IN OKONITE FACTORY.—WELDING IRON WIRES.

Our illustrations of this interesting plant show, in Fig. 1, the self-exciting Thomson-Houston alternating generator which furnishes the required power; in Fig. 4, two welders are shown, that on the right welding wires from No. 6 to No. 20, while that on the left takes wire from No. 6 up to that of one-half inch in diameter; the welder in the foreground of Fig. 3 takes wire from No. 6 up to one-half inch in diameter, and that in the background takes wire from No. 6 to No. 20; Fig. 2 shows a Thomson welder for iron wires.

If the operation of the electric welding plant above described may be taken as any criterion, the process, as applied to the manufacture of wire, is an assured success. The progressive Okonite people are among the first manufacturers in this line to adopt the system.

New York Board of Electrical Control.

At a meeting of the board, held last week, the subject discussed was the price the electric lighting companies were to pay for the use of the subways and whether the money should be paid in advance.

Ex-Judge W. H. Kelly, in behalf of the East River Electric Lighting Company, and Edward Lauterbach, for the Consolidated Telegraph and Electrical Subway Company, fought bitterly over the rentals.

Mr. Kelly said that $19,500 is demanded of his company for rent, $7,500 more than it paid last year. He argued that paying the rent in advance inconvenienced and injured the companies.

Mr. Lauterbach insisted that the Subway company desired to be reasonable, but that it had the right, under the decision of the Supreme Court, to demand rents in advance.

Mr. Kelly said his company had been overcharged by its landlord for inspecting work, and the demand for payment was accompanied by a threat that if the bill was not settled the wires would be cut. He also asserted that his company was charged for rent of a duct before it was completed.

Lawyer W. B. Pattney, for the East River company, supported Mr. Kelly. Mayor Grant wanted to know why the representatives of the other companies did not speak on the subject, and was told by Mr. Kelly that they were "shackled, gagged and crushed into submission" by an agreement they had entered into not to protest.

The board agreed that the East River company should pay one-quarter of its bill at once without forfeiting any of its rights, and that the question of modifying the rule would be discussed at a special meeting, to be held in a few days.

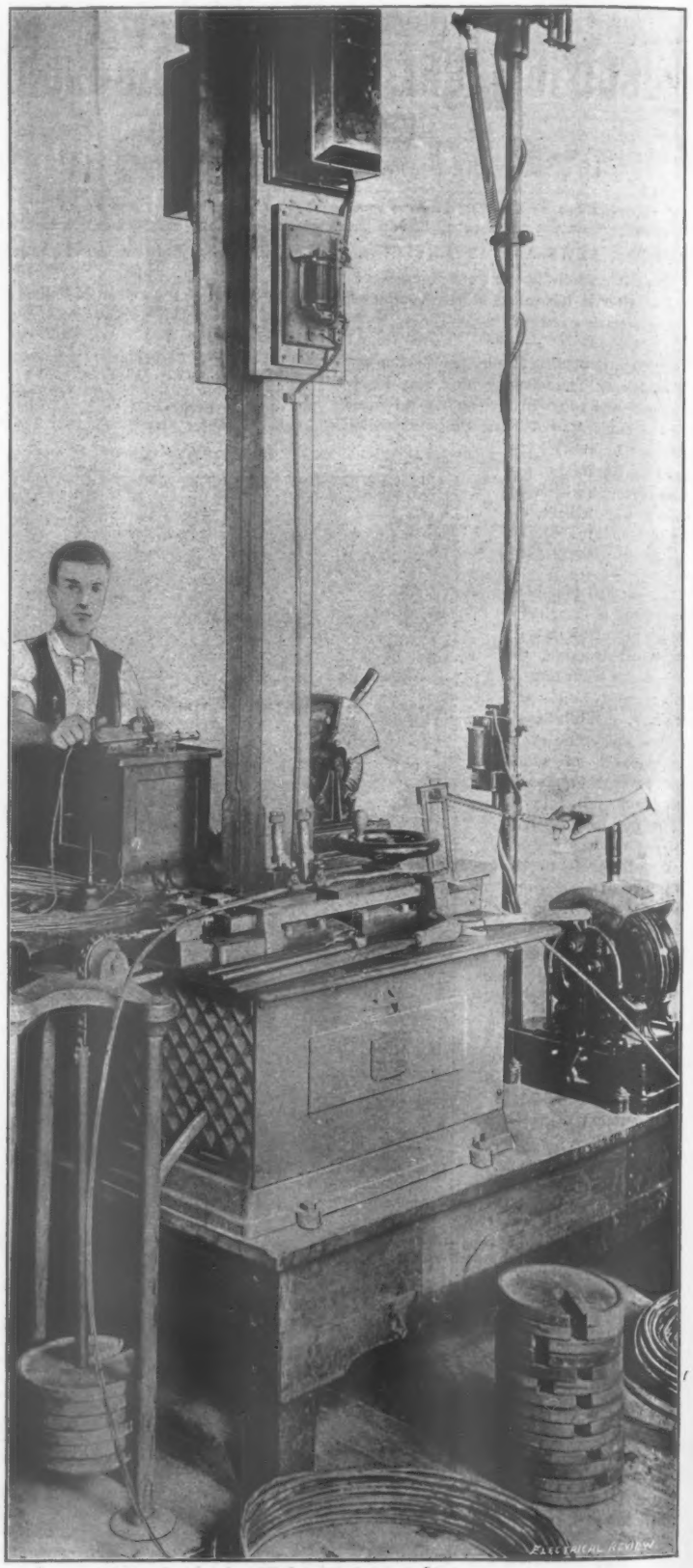

FIG. 3.—VIEW OF TWO MACHINES WELDING DIFFERENT SIZES OF WIRE.

For the Telegraphers' Club.

Marion Kerner's illustrated representation of the "Passion Play" of 1890 at Ober-Ammergau, was given at Chickering Hall last Sunday evening. The production was given for the benefit of the New York Telegraph Club, and was a very interesting and enjoyable event.

A Big Motor Plant.

The Eddy Electric Manufacturing Company, of Windsor, Conn., are installing a large electric motor plant at Zanesville, O., for the American Encaustic Tiling Company. They are building at their factories at the present time, and have about ready for shipment, two 100 horse-power motors. The size and perfect construction of these cause them to receive favorable comment from all who see them. This plant is a very large one, and the entire work is, we believe, in the hands of this well known electric motor company. The Eddy company is also manufacturing a 60 horse-power generator for the use of the State Capitol, at Albany, New York.

Nearly one-half the street railways of the United States are operated by electricity.

Western Union Telegraph Company.

The annual meeting of the Western Union stockholders last week was a very quiet affair. Only about half a dozen stockholders were present. Mr. Sage was there, but none of the Gould family attended. They were represented, however, by proxies. President Green read the annual report and commented upon it as he went along, adding much to its interest. He called special attention to the statistics of the company for the past 25 years.

After the meeting one of the gentlemen present made some inquiries as to what the company proposed to do in the matter of capitalizing its remaining surplus of $18,015,925 as given in the annual report. In reply to this inquiry, Mr. Sage stated that the matter had not yet been discussed by the directors. Informal reference has been made to it at times, but that is all. He intimated that there was a melon there which could be cut at some opportune time in the future. A pleasing feature of the annual report, and a novelty in its way, was the balance sheet, which has never before been given in a Western Union annual report.

Chicago, Ill.—Caribbean Construction Company, to construct railroads, telegraphs and telephones; capital, $1,000,000. Incorporators, Robert L. Martin, D. A. Courter, H. F. White.

Columbus, O.—Articles of incorporation have just been filed of the Columbus and Westerville Electric Railway Company. The incorporators are Moses H. Neil, Lewis Huffman, Geo. W. Williams, Adam Snyder and L. L. Rankin, of Columbus; J. C. Entrekin, Chillicothe; E. A. Denune, Adam Innis, Mifflinville; S. W. Meehn, A. B. Kohr and F. H. Houghton, Westerville.

Syracuse, N. Y.—Howard Thermostat Company; capital, $30,000.

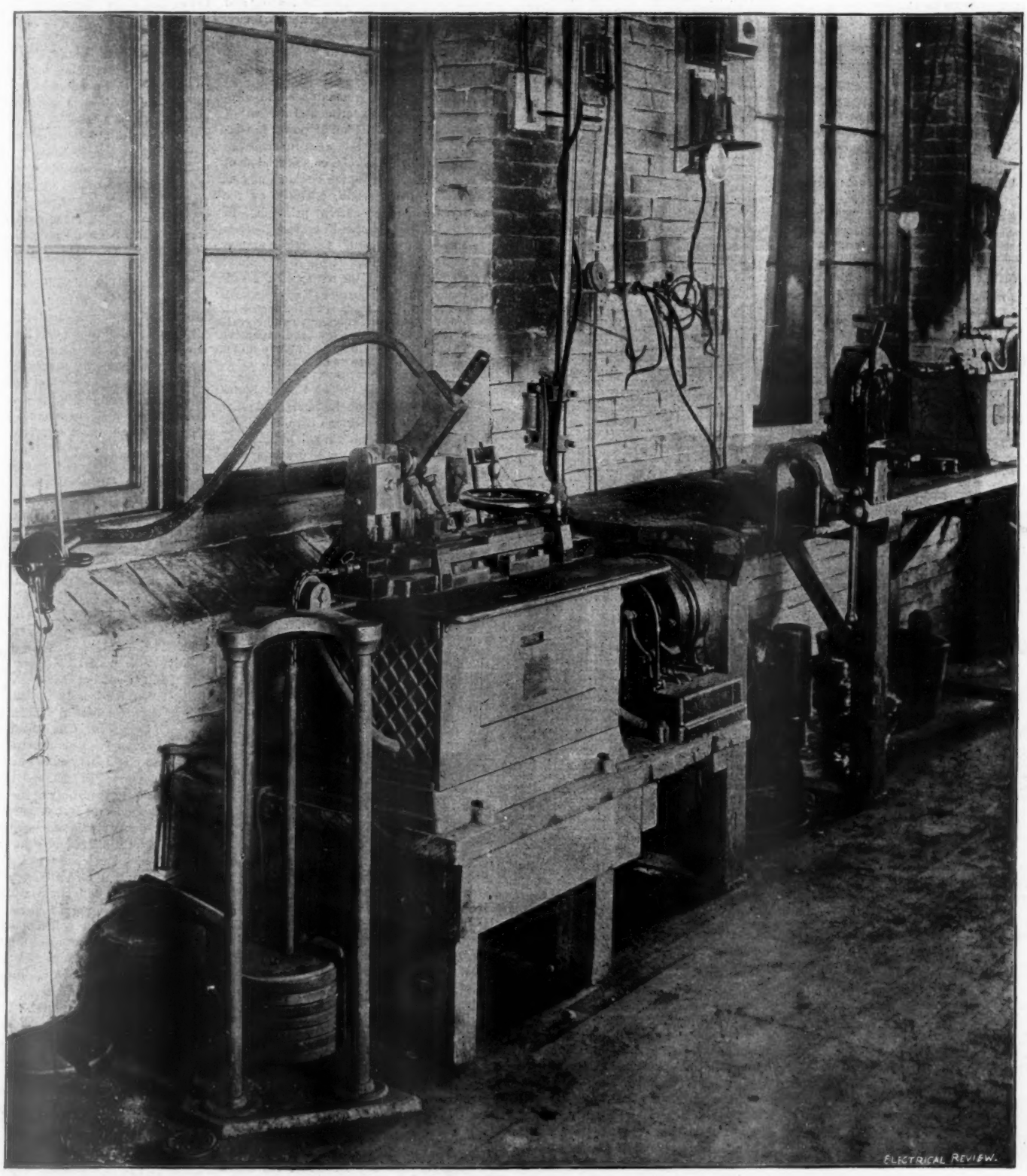

FIG. 4.—ELECTRIC WELDING IN OKONITE FACTORY.—VIEW SHOWING ONE END OF WELDING ROOM.

They show that during that time the messages have increased from 5,879,282 in 1867 to 59,148,843 in 1891. The receipts during the same time have risen from $6,568,925 to $23,034,326. The average tolls for messages have decreased from 104.7 in 1868 to 32.5 in 1891, while the average cost to the company of each message has been reduced from 63.4 to 23.2. In other words, the average toll per message to-day is about half the cost of handling the message in 1868.

Richmond, Ind.—The Early Electric Light Company, of Richmond, Ind. The capital stock is $25,000, divided into shares of $50 each. The term of existence of the company is to be 25 years. The board of directors shall be three and at present are Geo. P. Early, Charles Morris and W. W. George. The two latter gentlemen are from Pennsylvania, and have plenty of capital behind them to put the matter through.

Omaha, Neb.—Omaha Consolidated Electrical Company; capital, $10,000; to establish, create and lease power, electric light and power circuits, and to manufacture, sell, lease, operate and test electrical machinery, lights and power. Promoters, H A. Kinney, H. P. Kinney and Leavitt Burnham, of Omaha.

Omaha, Neb.—Omaha Consolidated Electrical Company; capital, $10,000.

St. Paul, Minn.—St. Paul Electric Manufacturing and Construction Company; capital, $100,000.

Columbus, O.—The Columbus and Clintonville Electric Street Railway Company; capital, $10,000.

Lockport, Ill.—Watkins Wire Company; to manufacture wire; capital, $150,000. M. G. Watkins, president.

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The delightfully entertaining historical sketches by the venerable Dr. Van der Weyde are continued this week. While the present day electrical workers can afford to smile over the curious ideas that prevailed a century and a half ago with regard to this science, great honor must always be accorded these early and enthusiastic delvers into the mystery that shrouded the work of the electric current.

The REVIEW as the exponent of electrical progress and science is much interested in all that pertains to the success of the World's Columbian Exposition, to be held in Chicago, in 1893. We are pained, therefore, to notice that, if reports be true, the managers are looking abroad for a poet for the occasion. There is one genius of the present day equal to the demands of such an event and his name is Eugene Field, an original and delightful poet who honors Chicago by residing there.

It is not necessary for us to announce that the REVIEW this week is of particular interest to electric power interests. A glance at its graphically illustrated pages will tell you this. The world of electricity is growing in interest and importance every day, and the REVIEW is proud to be its humble exponent.

The American Street Railway Association is in session at Pittsburgh this week. A valuable programme will be discussed, in which electricity comprises the leading and by far the most important part. The convention begins on Wednesday and continues three days, and promises to be more largely attended than ever before.

Universal interest is manifested in electrical circles in the experimental system of long distance transmission of power in Germany. The REVIEW this week furnishes an illustrated description of a commercial plant to be installed between the Neckar Falls, at Lauffen, and Heilbronn, operated on the multiphase or rotary current principle. In fact, part of the Lauffen-Frankfort generating output will be used. Doubtless numerous other commercial plants will follow. An announcement of the results of the official test of the rotary current system is eagerly awaited. If the claims of Herr Dobrowolski, that over 80 per cent. efficiency can be realized are substantiated, a new and expansive electrical industry will spring up and a new epoch of electrical history be entered.

The recent ruling of the United States Treasury that prints, photographs, and other reproductions of artistic and natural objects, when forwarded from abroad by mail, be seized and confiscated, will prove a very serious annoyance to architects and publishers who use photographs of buildings or works of art in foreign countries. The order is based upon an Act of Congress of March 3, 1879, which has heretofore been honored only in the breach because of its manifestly illiberal character. But Secretary Foster has seen fit, for some reason not apparent, to blow the breath of life into the dormant law. It has been the custom of importers to have such photographs as are wanted by their patrons transmitted by mail, paying the necessary duties before delivery. Not only are the tedious delays of transmission by freight thus avoided, but for such small parcels the mails are far cheaper and more convenient. It is difficult to see what the government has to gain by this move. The duty can be effectively collected either way. A hardship is imposed upon an industry which encourages progress in industrial art.

HIS OFFICIAL POSITION.

Last year the good people of Boston found that there was just one thing which they didn't know all about, and that was the whereabouts of the various electric wires.

Instead of assuming that they were everywhere and went everywhere, and then let the exceptions prove the rule, according to the tenets of the Bostonians, they set out to have this space in their knowledge box filled, and appointed to this hair-counting task B. S. Flanders, for many years superintendent of the Boston fire alarm, as inspector of wires.

As the stars in their courses fought against Sisera, so the types have prosecuted this good man from the very first, when his official cards designated him as "inspector of wines." Think of it! Such a designation for a man who is a consistent teetotaler, although he may not be a bigoted one—one who never got high except on a fixture, and who never had any bar under his elbow except a cross-bar.

And now comes the report of a recent meeting of the Boston board of aldermen in which this august body voted to transfer the inspector of wines to the fire commissioners.

Here again the types wrought injury, for the finer sentiments of the members of the commission must have been cruelly lacerated when, after reading the report and heroically resolving that they would rise to the dignity of the occasion in pursuance of the new duties imposed upon them, and with full sense of responsibility determine to personally acquaint themselves with every detail of the work, only to find that it was a miserable typographical error.

ELECTRIC RAILWAYS AND THE STREET RAILWAY CONVENTION.

Electric railways will be liberally discussed at the annual convention of the American Street Railway Association, at Pittsburgh, this week. In no department of industrial application has electricity experienced more rapid and widely diffused progress than in this. In five years it has grown from a single experimental line to a position of easy supremacy over all other modes of urban and suburban locomotion. To-day it is the proud boast of progressive towns and cities throughout the land, that true rapid transit is given by means of the electric railway.

Of the three competing systems of street car traffic, the horse is being fast relegated to a condition of happy desuetude, happy both to the stockholders, whose dividends were absorbed in oats, and to the faithful beast whose overstrained muscles may now relax under lighter employment. The cable system in a small percentage of cases, as in the thickly populated centers where the traffic is heavy and continuous, can still give odds to its younger rival, but the day is not far distant when it, too, must give way to the flexibility and easy transmission of electric power.

The convention is likely to be of great statistical interest in showing just what is the cost of the several modes of operation. Estimates heretofore made have been rendered unreliable by reason of the widely differing conditions of the roads compared. But an average taken from a large number of roads operated under the several systems easily awards the palm, on the score of economy, to electric traction. According to the United States census report, an average of 22 electric roads, 45 horse roads and 10 cable roads, shows the total operating expenses per car mile, respectively, to be $0.1405, $0.2894 and $0.2091, from which the superiority of the electric road is strongly evident. The same report indicates that the cost per passenger carried, including interest on investment, is, for the three systems, respectively, $0.0453, $0.0458 and $0.0477. It will be seen that electricity is also in the lead under this view; the comparison per passenger carried is not, however, a fair index of the relative commercial efficiency of the systems, as it is evident that the cable system is installed in densely populous districts where each car carries a much larger number of passengers. The electric cars run largely in suburban districts, and, if the traffic permitted, could carry more passengers with a trifling increase of cost.

The electric road only needs a chance in populous centers. It has been held back by a popular prejudice against the overhead system and the alleged inelegant appearance of the poles and conductors. A popular superstition that the wires are dangerous, stimulated by the inflammatory discussion of a scientifically ignorant press, has done more to nurture the spirit of opposition to the overhead system than architectural inelegance. Whilst it may be conceded that the poles and wires are not a poem in art, they are no worse than gas lamp posts, trade signs and other architectural monstrosities which are accepted as necessary incidents of commercial life. This spirit of opposition will, doubtless, gradually fade away, as it does not rest on a substantial basis. There are, of course, other methods than overhead systems of supply by which the electric power may be rendered available. The storage battery, it is claimed, is yielding satisfactory results on a number of roads, and an underground system of supply, although not yet beyond the experimental stage in this country, may ultimately prove efficient.

Street railway men have been fully alive to the advantages of electric traction; doubtless, the current convention will add materially to their enthusiasm. In five years the number of electric roads has grown in the United States from zero to 886, the whole number of street railway companies of all descriptions being 988. The exchange of ideas at Pittsburgh will probably give electricity a much higher proportionate representation at the end of another year.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Crystal Mica Company, miners and dealers in mica, is the name of the new corporation just started in business in this city, with offices at No. 620 Atlantic avenue.

The New England Weston Illuminating Company's business and real estate, in this city and elsewhere in New England, has passed into the hands of the Boston Electric Company.

The Simplex Electrical Company, of this city, will be represented at the Street Railway Convention by its popular general manager, Dr. A. F. Mason, who will have with him a full line of Simplex wires, including feeder lines.

Mr. F. Day Voorhees, general sales agent of the Norwich Insulated Wire Company, of New York, was in Boston for a few days this week, looking zealously after the interests he so ably represents. Mr. Voorhees made a pleasant call at this office.

Mr. Samuel A. Chase, of the Western Electric Company's New York branch office, has prolonged his sojourn in this city owing to increased activity in the electrical business of this section. Mr. Chase has signified his intention to be on hand at the Pittsburgh Convention.

Mr. Geo. H. Morrison, the well-known mechanical engineer, No. 9 Federal street, this city, has been kept very busy recently making practical tests on the steam equipments of electric light and electrical power plants. Mr. Morrison is one of the most experienced and thoroughly practical men in the business.

Messrs. Whitmore & Robinson, consulting engineers, of this city, are getting out a neat pamphlet descriptive of their business. This young, yet enterprising firm, has already in hand a large amount of testing and experimental work. They are giving special attention to designing electric lighting plants for towns and public buildings.

Badger's Self-Oiling Trolley Wheel is attracting the attention and favorable criticism of electric street railway people. It is manufactured by Messrs. Badger Brothers, West Quincy, Mass. The wheel is made of composition metal, nicely turned and free from blow holes. Among the claims made for this wheel are, "it insures a good bearing always on the wire; obviates noise or rattle of a dry bearing; does not slip or jump on the wire, and requires no attention when once filled with oil."

New Mica Discovery.—Mr. E. D. Woods, a prominent and prosperous inventor of New England, formerly of Bennington, N. H., and at present a resident of Boston, recently discovered a mica mine in Northern New Hampshire. This mine covers an area of 80 acres, and never has been worked. The samples of mica—from the recently discovered mine—possess peculiar merit and seem specially adapted for various electrical purposes, being smooth and clear, free from sand or grit, and not in the least flakey. Mr. Woods resides at the Quincy House, Boston, and will be pleased to reply to inquiries regarding his mica mine, either by letter or in person. W. I. B.

Boston, October 17.

OUR PITTSBURGH LETTER.

Mr. Will. Hine, manager of the New York office of the Westinghouse Electric and Manufacturing Company, was a visitor to the city this week.

Hon. Chris. McGee, the famous Pennsylvania politician, is heavily interested in Pittsburgh street railways. The "Philadelphia syndicate," composed of Messrs. Widener, Elkins and others, also holds valuable franchises.

The Monongahela House, which will be convention headquarters next week, will be filled with "the boys" from cellar to roof. All the rooms are now engaged and the proprietors have chartered five Pullman sleeping cars, which will be run onto side tracks near the hotel and used to accommodate the overflow.

The Solar Carbon and Manufacturing Company, 95 Fifth avenue, have recently perfected a carbon and aluminium trolley wheel, the invention of Mr. F. B. Laughlin, the head of the company. The central portion of the wheel is made of hard carbon while the flanges are of aluminium. Under recent tests, the new wheel ran very cool and with practically no wear.

Mr. George B. Hill, a prominent man in financial circles here, is also a director in the Pittsburgh, Allegheny and Manchester Traction System and president of the Allegheny Traction Company. "The population of Pittsburgh and Allegheny City combined is about 375,000," said Mr. Hill. "I have computed that the street railways of the two cities carry daily over 50 per cent. of the population."

A "**traction company,**" under the Pennsylvania State laws, is not at all the same thing as a street railway company, although it may be. The best analogy for a traction company is that of a middleman between manufacturer and consumer. The traction company obtains a charter and franchise from the State and favorable ordinances from the city. Then it sublets or rents these privileges, under an easement, to one or more street railway companies; or it may operate a street railway of its own.

Pittsburgh, October 17. S. L. C.

OUR ALBANY LETTER.

One of the Hamilton street cars of the Albany Railway caught fire opposite the market site, Friday night, and was very badly damaged.

The Albany Railway has placed an order with the Gilbert Car Works, of Troy, N.Y., for 10 or 12 elegant new motor cars, which are required by their opening a number of branch lines.

The New Building of the Albany *Evening Union*, corner of Green and Beaver streets, has a complete equipment of electrical apparatus, having been thus supplied by electrical contractor Paul G. Burton.

All during the baseball season just passed the Watervliet Railway, which runs past the ball grounds, has carried extra cars attached to its motors to accommodate the immense crowds. Baseball has been the source of a large income to the railway.

Workmen in large numbers are busily engaged in erecting the handsome new stone building of the Hudson River Telephone Company, on the corner of Maiden Lane and Chapel street. They will endeavor to get it closed before very cold weather sets in.

The Laying of the Tracks for the branch of the Albany Railway will be completed and motors running within 10 days. The branch will extend from the Union depot up Steuben to Eagle street, and join the main road at Washington avenue. A single track will be laid, with two switches. About 30 men are employed on the work.

At a special meeting of the newly elected board of directors of the Albany Railway, Thursday, the following officers were chosen unanimously for the ensuing year: President, Robert C. Pruyn; vice-president, Anthony M. Brady; secretary, James McCredie; treasurer and general manager, John W. McNamara. The executive committee to be appointed by the president was not named, as Mr. Pruyn was in New York. No other business was transacted.

Albany, October 17. L. M. W.

OUR CLEVELAND LETTER.

Mr. P. C. Ackerman, general manager of the New York office of the American Electrical Works, of Providence, was a Cleveland visitor this week.

The Short Electric Railway Company's offices are located in the handsome brick building formerly used by Mr. Brush as a private experimental laboratory.

Thos. H. Lovell & Company, manufacturers of electric railway supplies, are designing a new trolley stand, and have recently put upon the market a new type of wooden-toothed gear wheel.

The Cleveland Electrical Manufacturing Company reports business good. General Manager Foster says he has in hand five contracts for wiring hotels and that the demand for his company's watchman's time detector is steadily increasing.

The Buckeye Electric Company is erecting a large factory in Cleveland. The present plant has a capacity for making 500 lamps per day. The new factory, which will probably be finished about January, will have a capacity of 5,000 lamps per day.

Mr. Charles F. Brush's magnificent residence and grounds, on Euclid avenue, are being further improved by the addition of a very complete and perfect series of greenhouses. The cultivation of beautiful and rare plants is a fad in which this eminent electrical inventor takes great delight.

The Brush Electric Company's immense factories present a very busy scene. The general improvement in business in the West is manifest here, where direct results are appreciated. Several large additions to the factories are in process of construction. A number of very large orders for apparatus are on hand and are being filled as rapidly as possible.

The Short gearless motor will be shown at the Pittsburgh convention in active operation under a handsome car which will run on a switch track in front of the Monongahela House. The car will be equipped with measuring instruments, so that the visiting street railway men may have an opportunity of judging for themselves as to the economy of this motor. The Short gearless has recently been improved so that a car equipped with it can mount a 9.5 per cent. grade without using an excessive amount of current. Besides the gearless motor, there will be exhibited a Short 50 horse-power generator, S. R. G. and Standard Short motors, and a power station switchboard set up in front of the hotel. The company will be represented by Prof. Sidney A. Short, General Manager E. E. Higgins, Mr. Gibson and six agents. Besides having large orders for gearless motors already in hand, it is evident that the Short company is out for business and intends to make a strong bid for it at the Pittsburgh convention. S. L. C.

Cleveland, October 15.

OUR DETROIT LETTER.

President Blades, of the Detroit Motor Company, is just recovering from a severe illness.

Mr. Frank B. Rae, electrician of the Detroit Electrical Works, is hard at work upon a new motor.

Mr. W. A. Jackson, vice-president of the Detroit Electrical Works, is spending a few days in New York.

The American Brass and Metal Works are having a great run on brass work electroplated in their well-known antique finish.

A Detroit lamp trimmer makes lively time on his rounds mounted on a bicycle made of two carriage wheels. It isn't as handsome a machine as a Columbia, but it possesses great "git thar" qualities.

The Crescent Brass and Iron Company have in hand several large contracts for brass push buttons, and other electrical house goods. They make a specialty of doing this kind of work for electrical supply houses and others.

The Commercial Electric Company is booming the "Sun" arc lamp. This company has recently completed several large electric light installations, among the number being a 200 arc light plant in the Hudson building, this city, and a 1,000 light incandescent plant at Coldwater, Mich.

Recent contracts taken by the Detroit Electrical Works for electric railway equipments are as follows: Equipment for Worcester, Mass.; an additional order for three equipments for the Calumet Electric Railway, at South Chicago, Ill.; a 100 horse-power generator for the same road, and a 100 horse-power generator for the Queen City road at Marion, Ind. The Detroit Electrical Works has found it imperative to increase their manufacturing facilities. Work will very shortly begin on a large addition to their present plant on Woodward avenue. Although this company is comparatively young in the electric railway field, it intends to be heard from among the "select few."

"**Westward** the electric car of progress rolls along," is the modern form of the quotation. Thus, the editor of the Mt. Pleasant *Democrat:* "The editor of the *Democrat* was in Detroit this week and enjoyed the old time sensation of a ride about the streets in cars drawn by horses. The present generation can, no doubt, readily recall hearing their grandparents tell of this sort of locomotion in ages past and gone, but 'tis a rare thing to hear of in the present progressive epoch in the world's history. However, Detroit people don't seem to mind it very much. All Michigan is proud of our beautiful metropolis, but we do dislike to see her ape the effete East and thus cling to antiquities. Bric-a-brac looks all right on a mantel, but illy graces the streets of a thriving city."

The Detroit Electrical Works will be represented at the Pittsburgh Convention by Messrs. C. A. Benton, J. E. Lockwood and F. H. Talbot. They will have on exhibition on the tracks of the Duquesne Traction Company a car equipped with one of their 40 horse-power standard electric railway equipments mounted on a McGuire truck. This exhibition car will run over the line named above and will be for the exclusive accommodation of delegates attending the convention. Besides this, Mr. Benton will have on exhibition in Room 54 at the Monongahela House a beautiful working model of the same equipment mounted on a new cantilever truck designed by the Detroit Electrical Works. The model is nickel plated and cost $500. It is complete in every respect and is built on a scale of about one to eight. The model clearly shows this company's new brush holder and brake, besides all the other valuable features, in detail. Mr. Benton wants everybody to come and "see the wheels go round." S. L. C.

Detroit, October 16.

C. F. Heinrichs committed suicide in Chicago last week. He was formerly engaged in electrical work.

Electricity is continually called upon to assist the manufacturer and it seems never to be found wanting. The interesting and practical work done by means of electric welders, described elsewhere, is but another advance that this science is ever scoring.

The Western Union Telegraph Company intends to frame handsomely the first telegraph message ever sent, which was in May, 1844, and exhibit it in the electrical department at the Exposition. The message was received by Professor Morse, at the Capitol in Washington, from an assistant in Annapolis.

An Economic Aspect of the Electric Railway.

To the Editor of Electrical Review:

A great many of those at present interested in horse railways, when considering the question of substituting electric for animal power, do not take full account of several features of importance. They look askance at the traffic reports of their more advanced brethren showing very heavy and often extraordinary gains in the number of passengers carried on those roads on which electric service has been inaugurated. They seem to constitute a body of doubting Thomases, as much as to say the returns have been "fixed" by the management. But if they will consider a little they will find many reasons of the most substantial character which determine positively an immediate and considerable increase in traffic. Chief among these is the disposition of patrons in general to economize time.

This disposition is most pronounced among the working classes of all kinds, and they constitute the greatest portion of passengers on the average street railway. An average case would be that of a mechanic who earns three dollars per day of ten hours work, or 30 cents per hour, which is the valuation he places on his time. Such a man living two miles from the shop consumes one hour per day walking to and from work, a loss of 30 cents in time value. If he ride on the average horse car he will save ten minutes, or five cents in time; but, as the riding costs him ten, his saving is rather questionable, and in most cases, if he is a thinking sort of workman, he will walk rather than ride. But now offer him the chance of riding on an electric car which he can rely on taking him over the two miles in about 14 minutes, or four miles in 28 minutes, and he at once sees the advantage. He now saves 32 minutes of his time, which, at one-half cent per minute, is worth 16 cents. The riding costs him ten cents, so that after paying his fare he actually saves six cents per day. The saving is greater in proportion as the distance is longer. Not only does he save in time (and therefore money), but he reserves his energy for his day's work and works better and in a more cheerful frame of mind.

Thus the railway cars become an economic element of work-a-day life, the habit of riding is formed and ever after that individual proves a constant patron.

The professional man, the business man, the clerk, all take the same line of reasoning, modified perhaps by the thought that the saving of time permits more leisure in their preparations for leaving home.

The mere feature of rapid transit necessarily carries with it a greatly increased car mileage per day. A horse car seldom makes more than 70 miles per day, while on a well scheduled electric system the cars regularly travel from 120 to 140 miles. There being no balky horses to deal with, no possibility of the cars being stalled on grades or curves, a time schedule can be made and adhered to. And the resident soon knows the exact time when he can leave his house and be sure of catching his car. The comfort of this situation has a marked effect on the rapid increase of traffic.

Again, patrons of an electric system as a rule do not become impatient at a temporary obstruction to the car, for they feel that the moment it is removed the car can be speeded up to compensate for loss of time. This is peculiar to the electric system. On a cable system, after a detention the cars are restricted to the speed of the cable, which is a fixed quantity, and if the delay has been of some duration the long line of cars after starting remains in the same relative position, greatly interfering with the regular street traffic. But on an electric system, once the track is cleared of the obstruction the first car can speed up considerably beyond the normal rate, the second likewise, but to a less extent, and so on, the successive cars gradually opening gaps in the line and avoiding the annoying congestion of street traffic.

The average patron of a street railway is quick to recognize every little advantage he can derive from improved methods, and upon the inauguration of an electric system he soon becomes posted as to what he can rely upon in the service, and very promptly strikes the balance which inevitably shows the profit to him in saving his time. The largest showing of gross earnings is made up one nickel at a time; and the horse railway manager who is alive to these facts will find no difficulty in arriving at the conclusion that the sooner he converts his system into an electrical one, the more profitable it will become. T. J. McT.

New York, October 17.

Telephonic News

*** The Bell Telephone Company is removing its wires from the poles to the conduits in Rochester, N. Y.

*** The Bell telephone building, Cincinnati, will be remodeled at a cost of $20,000, by S. Hanford & Sons.

*** The telephone company at Portland, Me., will commence the work of putting the wires underground as soon as the necessary permit is granted by the city.

*** A number of important telephone patent contest cases, which have been pending in the patent office for years, will be heard by the commissioner of patents during the present month.

*** The new quarters of the Telephone Exchange, on the fourth floor of the Pennsylvania Trust Company building, were visited by several hundred persons last evening. The new switchboard was an object of interest and curiosity, and its uses were explained by Manager Lerch and his assistants. During the evening the local office was connected with the New York Exchange, and the visitors were treated to a vocal and instrumental concert.—*Reading, Pa., Telegram.*

An Electric Crank.

The man in the Hudson County insane asylum who was afflicted with the idea that he had a telephone in his stomach now thinks he is being tortured, says the New York *Sun*, with electric batteries. This man was a telephone crank before the first telephone was put in use. It had been his hobby for a year or more. He began to hear voices talking to him wherever he went. Soon after the first telephone came into use he visited a place where there was one to experiment with. The instant he heard a real voice through the transmitter he became violently insane. He smashed the instrument to pieces. He was taken to the Hudson County asylum in a straitjacket, and has been there ever since. He was one of the curiosities of the asylum. He talked rationally on any subject that visitors chose to talk about, but right in the middle of his conversation, without any warning, he would exclaim:

"There's that fellow again, dang it all. Hello! hello! down there; what's wanted? Now, just hear him ring that bell, as though I didn't hear and answer him. Hello! I say, down there, hello! Well, if he won't answer, let him go."

Then he would resume conversation just where he left off. Sometimes he would think the imaginary voice answered him, and would carry on a long conversation with him, always at the end complaining of the rumpus the fellow created in his stomach.

The officials of the asylum don't know what caused him to change his delusion. It was done suddenly. One day recently, when the doctor talked with him, he said: "This is awful, doctor. Those batteries down stairs have got to be taken out. They are killing me." The doctor asked him for an explanation, and he said that a lot of batteries had been put in the cellar, and that wires running from them went right through his body. "Then they turned them on!" he exclaimed, and began to dance up and down, and shout and cry out in apparent agony. At last he gave an extraordinary loud shout, and his arms and legs flew out and about in every direction.

He explained afterward that he had been blown to pieces by the electricity. At intervals ever since then he has had similar spells, which very often ended in his blowing to pieces. He acts and talks rationally nearly all the time. In the midst of one of these spells, one day, the doctor said to him: "You are only fooling yourself. There is no battery and no electric machinery in the cellar. Come with me and I will show you."

The man accompanied him gladly. The cellar was searched thoroughly. When the search was concluded the man turned on the doctor and said: "You are a foxy doctor, ain't you. You knew you would bring me down here, and so you had it all taken away to fool me, but you can't do it." The doctor went back upstairs with him. At the head of the stairs the man said: "There, you pressed the button and it's back again. You don't dare take me down now."

ELECTRICITY 150 YEARS AGO.

A BACKWARD GLANCE AT EARLY EXPERIMENTS—BY DR. P. H. VAN DER WEYDE.

II.

A book, entitled, "Philosophical Instructor on Experimental Philosophy, by Benjamin Martin," was published in London, 1743, and reveals some additional causes why several centuries elapsed before any interest was taken in the then novel discoveries in electrical matters.* The Latin language was then the universal method of communication between learned men, so that most all books intended for such were written in Latin, and in this way kept from the public knowledge, notwithstanding the printing press had been invented and was doing its duty. But as bookmakers found that books in the native languages of England, France, Holland and Germany, found a far more ready sale than the Latin books, publishers began to encourage translations of works, which (as the above mentioned book expresses it) "had been locked up too long in the philosophical cabinets and libraries of the *savants*," while the publication of such translations caused the pubiic to take some interest in the pursuit of physics. The author adds: "The old superstition that the investigation of nature is injurious to the cause of religion begins slowly to disappear, when it is found that, to the contrary, religion receives a strong support by the translation of books written by learned men who are seeking to understand divine wisdom and power by the study of creation."

The increased demand for books caused a profuse production, so that they became cheaper, while at the same time it became a regular business to manufacture and sell at reasonable prices various kinds of apparatus, with which the truth of the new discoveries could be verified and demonstrated in colleges and schools.

The translator of the above mentioned book of Martin (published in Amsterdam, 1744) says, in his preface: "Physical societies are being generally established, especially in England and in Holland, where lectures and experiments are given before the members and their friends, while wealthy persons make collections of many expensive machines, with which they show their visitors and friends philosophical apparatus and give them electric experiments in place of treating them on delicacies of meat and drink, as thus far has been customary."

PLATE D.—COPPER PLATE ENGRAVING FROM NOLLET'S "RESEARCHES SUR L'ELECTRICITE," INTENDED TO POINT OUT WHICH WAY THE ELECTRIC CURRENT DOES FLOW.

Personally, I can testify that this is still the case in Holland. I was for several years, until I left, in 1849, the regularly appointed lecturer before the Physical Society of the city of my residence, lecturing two evenings each week, while from time to time, I was engaged to deliver lectures especially on electricity before similar societies in neighboring cities. All of these societies possessed a cabinet of well selected apparatus, while by the aid of members almost anything needed could be obtained, as there was scarcely any of them who did not have some special hobby in the line of physics.

As in the latitude of Holland the Winter evenings are very long, the lectures begin at seven and last, with the discussion, until nine, when in some societies coffee, with sandwiches, etc., are served. I found this still to be the case in a physical society in old Dutch Albany, and also in some meetings of the Historical Society of New Amsterdam, now called New York; also in some meetings of the New York Electric Club. In Albany some members told me that it was chiefly done to keep the members in to the end of the lecture, if the lecturer was dry or read a long and tedious paper in place of lecturing, so that his feelings should not be hurt by losing more than half of his audience before he was half through. This may be a useful hint to some other societies, which labor under that very difficulty.

In the larger cities of Holland such societies never depend entirely upon the members alone to fill the programme, but have always an appointed lecturer who gives a regular course of connected lectures on certain special subjects. This is the only true way to promote the thorough understanding of the various departments of physics, while naturally disconnected lectures, given by various members, can never lead to a thorough understanding of any branch of physics, such as electricity, or optics, which are at the present day so extensive that it is utterly impossible to give any clear idea of it in a single lecture.

When looking in the alphabetical index of the book referred to above for the subject which is treated here, I found: "Electricity—What it is, page 126." I was surprised at the wisdom of the author, who surpassed that which we possess at the present day, and turning to that page I find the explanation in answer to the question, as the book is written in the form of dialogue (or rather like a catechism).

"*Question.* What is electricity or burnstone power?

"*Answer.* A kind of attractive capacity possessed by some bodies, like burnstone, agate, glass, etc. The minute exhalations of these bodies are of such a nature that when they are heated by friction they attract light bodies and also repel them, but not beyond the sphere of their attraction, so that they are compelled to return again. If the tube

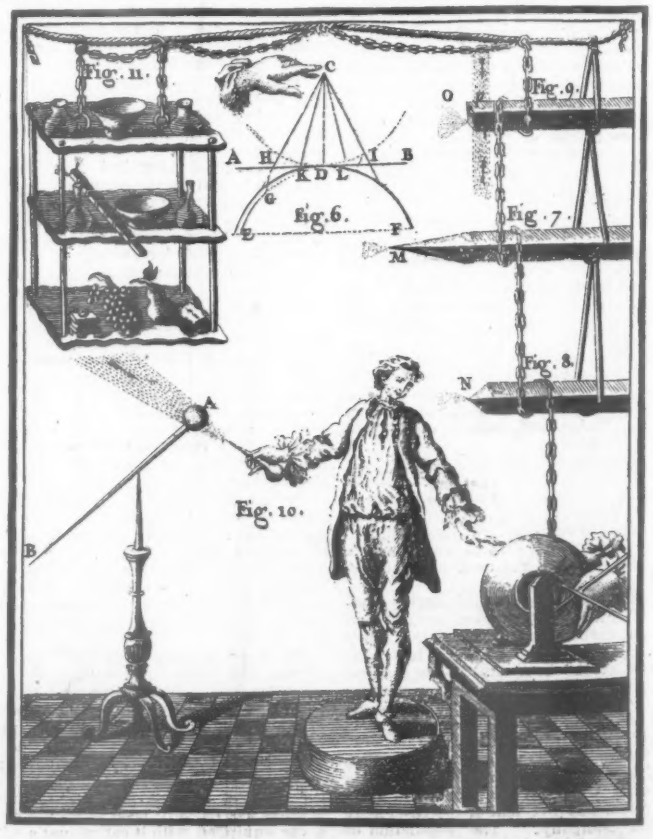


PLATE E.—ENGRAVING REPRODUCED FROM NOLLET'S BOOK, SHOWING THE EFFECTS OF ELECTRIC CHARGES UPON EVAPORATION, ETC.

* A few chronological misprints escaped correction in the former article. On page 112, third column, lines 18 and 19 "13" should read "20"; in line 26 "twelfth" should read "sixteenth"; in line 32 "400" should read "100."

is heated over the fire it does not acquire these attractive and repulsive powers, but if then cleaned and rubbed it will acquire very great power, because this opens the pores so that the exhalations can be more freely thrown out.

PLATE F.—SHOWING L'ABBE NOLLET WATCHING THE EXPECTED DEADLY EFFECT OF A CONTINUAL ELECTRIC CHARGE ON ANIMALS.

"*Q.* How are these exhalations the cause that feathers, hair, etc., which they encounter, are attracted and then immediately repelled again?

"*A.* That is as much as there is in this matter, but what the real cause is of that attraction, and of the attraction of gravitation, Newton himself confessed that he was totally ignorant of its cause and this notwithstanding he has based upon this attraction the whole structure of his philosophy. Therefore, let us abandon this subject and now treat of the more useful and different properties of natural bodies."

Then the author treats on porosity, hardness, elasticity, etc., of solid bodies.

Now, let the reader mark the difference between this confused pretense of an explanation and the conclusions arrived at by Musschenbroek, which were mentioned on page 112 of our number for October 17, where he prophesies that "future experiments must be made by which we will solve some problems, but at the same time reveal new facts, of which at present we have no conception," while Martin dismisses the subject in order to pass over to something "more useful," evidently convinced that electric research never will amount to anything.

We give, in Plate D, a reproduction of Nollet's device intended to point out which way the electricity is moving; if passing from the charged body to that in the natural state, it would prove that the theory of one kind of electricity is correct, as then the flow would always proceed from the partially charged body to that in the natural state or in a state of deficiency. For this purpose he arranged matters in such a way that the observer could be made to be unaware which of the two persons between which a luminous pencil or spark jumped over was charged and which person was neutral. It was proved that the light bodies were just as well attracted by a hand which was not charged, provided these light bodies were placed on a conducting surface which was being charged; this is represented in the upper part of the plate, while in the lower part the spark or electric brush could be observed in the dark. It was found to be entirely impossible to determine which of the two persons was charged, as the finger of the person not charged, seen at the right side, produced a luminous pencil to reach the flat surface of the opened charged hand at the left, entirely identical with that produced when the finger was charged and brought opposite to a hand in the neutral condition.

In order to find out the effect of a constant charge on liquids and vegetable objects, Nollet devised a set of insulated shelves which he could keep in a charged condition for many hours, by keeping the glass globe rotating by hand power furnished by shifts of two or three men working alternately. He found that vegetables lost more of their weight in a given time when electrified than when not electrified. This made him experiment on fluids, and he found that the electric charge increased the evaporation of all such substances as contained water, and still more in alcoholic liquids; he proved that fatty oils and mercury did not exhibit any diminishing in weight, so that in such cases the electric charge was ineffective.

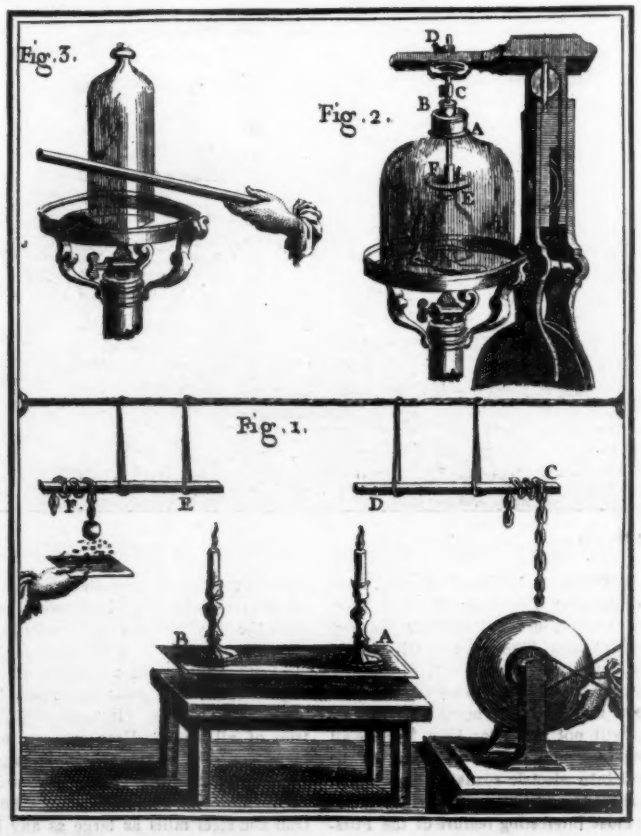


PLATE G.—FIG. 1 SHOWS THAT THE FLAME IS A CONDUCTOR; FIG. 2 IS A MACHINE PRODUCING ELECTRICITY IN VACUO; FIG. 3, A TEST PROVING THAT ELECTRIC ATTRACTION TAKES PLACE IN A VACUUM.

This experiment is represented in Plate E, Fig. 11, where fruit and dishes with liquids are kept electrically charged, and the excess of evaporation noted when compared with similar bodies not charged.

He also adds tables of the amount of loss by evaporation of different liquids in a given time, as far as due to the electric charge, but as at that time instruments to determine the amount of the charge had not been invented these tables are useless.

The same plate shows, in Figs. 7, 8 and 9, the luminous brushes as seen in the dark to proceed from the angles and points of conductors when charged, Fig. 10 shows the flow of the hypothetical electric fluid, producing alternate attractions and repulsion, while Fig. 6 serves for a geometrical attempt to explain why a globular surface E, G, K, D, L, F, does not radiate its electric charge as readily as is the case with the points N, M, O, Figs. 7, 8 and 9.

The next experiment was to find out in how far such a long continued electric charge could benefit or hurt man by the increase of his perspiration, in case such an increase was desirable. As, however, he himself did not wish to take the risk of being gradually killed by the continual charge, and being too conscientious to risk other people, he tried it first on animals. This is shown in Plate F, Fig. 4, where he is seen watching how soon the animals would be killed, in case such a continual charge had a mortal effect. However, nothing of the kind happened, only the increased evaporation showed itself when compared with the loss of weight of similar animals not charged, but otherwise placed in the same condition. He experimented here first on animals before he made the experiment upon himself, in the same way that Montgolfier, 50 years later, sent up some animals with a balloon in order to find out if the high elevation to which the animals were to be carried would not kill them. When the animals came down again safe and sound, he went up himself; in the same way the Abbé Nollet, when finding that the animals were all right after six severe hours electrifying, he tried it on himself, and so was the pioneer in the medical application of the dry electric bath, of which, only at the present day the value for increasing both the perspiration of the skin and the evaporation of the moisture in the lungs is beginning to be recognized.

In Fig. 5 of the same plate is represented another way of showing the mutual repulsion of a spray of water, as also seen in Plate C, page 113.

Plate G, Fig. 1, represents an experiment intended to show the flame of a candle and the hot air above it to be a good conductor. Two metallic candlesticks are placed on an insulated metallic plate A, B, the metallic rod C, D, is charged by the revolving globe at the right, and its charge is communicated down candle A and up candle B, to the rod E, F, which shows its charge by the attraction of the light bodies under F. At present we use an electrcosope to verify such charges, but in Nollet's time the electroscope had not yet been invented.

Fig. 3 shows that a glass rod rubbed so as to make it electric, will attract light bodies in the vacuum of a bell jar exhausted by the air pump.

Fig. 2 represents the identical machine advertised in 1735 by Jan van Musschenbroeck (see his price-list, page 29 of ELECTRICAL REVIEW, September 12). No. 4, intended to produce frictional electricity in a vacuum, and which Nollet bought from him, being in active correspondence with his brother the professor, whose letters on the Leyden jar were by Nollet recorded in the annals of the French academy.

TELEGRAPHIC

.... The Wisconsin Electric Club, Milwaukee, gave a very enjoyable banquet, October 8.

.... James Gordon Bennett returns from Europe this month to accompany John C. Mackay to Puget Sound to arrange for a commercial cable plant to China.

.... It was stated at Baltimore, October 12, upon good authority, which seems to be practically official, that the $5,000,000 of Western Union Telegraph stock owned by the Baltimore and Ohio Telegraph Company, has been sold back to Mr. Jay Gould. Mr. Gould, or the people who have bought stock for him or in conjunction with him, began more than a year ago, it is said, to negotiate for this stock. It is said that the price offered has been twice raised since that time, and it is understood that the whole block goes to the New York purchasers at close to $90 per share. People at Baltimore more or less closely identified with Gould interests, and whom it is believed have had something to do in the negotiations which have led up to the transfer of this Baltimore and Ohio Telegraph interest, say that the purchase of the stock by Mr. Gould will have the immediate result of an extra dividend upon Western Union, inasmuch as it has been Mr. Gould's policy to accumulate a surplus without any increase of payments to stockholders so long as this big block of stock has been held by one outside interest.

.... One of the most expert telegraph operators in the service of the Western Union Telegraph Company is Charley Smith, the happy-faced young fellow who receives the first reports of arriving vessels in this city and then spreads the news throughout the country. Charley is located at the Battery. A few days ago a friend of his, also an operator, slipped into his office in a most mysterious manner and quietly announced that he was dodging a creditor. When the coast was clear the friend withdrew, and Charley met him an hour later treating an elderly gentlemen to a table d'hote dinner. Before Charley left the restaurant his friend discovered that he was entirely "broke," and threw several appealing looks in his direction. Finally, seeing that his mute message was not understood, the young fellow asked for a loan by tapping on his plate in the telegraph code. "Oh, stand him off," Charley answered, in the same dumb language. "Can't do it," came back from the plate, "this is my best gal's old man; he's eating on me and I'm broke, see." Charley then went over to his friend and, calling him by name, threw him a five dollar note and thanked him for his kindness in lending it to him. The friend put the bill in his pocket, lost his job next day and left the town.—*Morning Advertiser.*

The Perret Electric Motor.

The Elektron Manufacturing Company, of Springfield, Mass., has issued a very striking catalogue descriptive of the Perret electric motor. This motor is one of the best in the field, and is rapidly growing in favor in all directions where electric power is required. Among the points of particular excellence claimed by this motor are its high efficiency, low speed, extreme simplicity, durability and great economy. The catalogue contains a number of testimonials speaking in the highest terms of the work done by the Perret motor. The officers of this company, which has a New York office at 89 Liberty street, are the following named gentlemen: President, W. D. Sargent; vice-president, W. E. Wright; secretary, John C. Reilly; treasurer and manager, E. H. Cutler, and electrician, Frank A. Perret.

THE ELECTRIC RAILWAYS OF PITTSBURGH AND ALLEGHENY CITY.

WHAT CAN BE SEEN AT PITTSBURGH—THE WESTINGHOUSE GEARLESS MOTOR.

(Editorial Correspondence.)

When the members of the American Street Railway Association, at their convention in Buffalo, last year, decided to hold their next session at Pittsburgh, Pa., they exercised very excellent judgment in their selection, for the reason that this city probably offers greater advantages for such a gathering than any other city in the Union.

In substantiating this statement, it is only necessary to cite the following facts: Owing to the peculiar situation of the twin cities, Pittsburgh and Allegheny, hemmed in as they are in the narrow valleys of the Allegheny and Monongahela rivers by very steep hills, the natural growth of both cities was, of necessity, along the banks of these rivers. Thus the cities came to cover many miles of area along the streams, and, of course, this condition of affairs led very early to the establishment of street car accommodation. The result of this has been that these cities have to-day a net of street car lines, which in comparison is, perhaps, larger than that of any other city of similar size in the country.

The population of the city of Pittsburgh is largely composed of practical men of business, whose reputation for possessing the sense of progressiveness in a superior degree has been well established, and when, therefore, a few years ago, it became manifest that the days of the horse car were numbered, this city at once commenced to transform the primitive mode of street car motive power into the modern systems. In 1886, two electric and one cable road were constructed in Pittsburgh, and since then street car travel in this city has been practically revolutionized. At this writing the following street railways are in operation in Pittsburgh:

The Fifth Avenue Traction Road (cable), The Oakland Street Railroad (electricity), The Duquesne Traction Road (electricity), The Central Traction Road (cable and electricity), The Birmingham Traction Road (electricity and horses), The Citizens' Traction Road (cable and electricity), The Pittsburgh, Allegheny and Manchester Passenger Railroad (electricity), The Union Passenger Railway (horses), The Rebecca Street Railway (electricity), The Transverse Passenger Road (horses), The Troy Hill Street Railway (electricity), The Federal Street and Pleasant Valley Street Car Line (electricity), The West End Street Car Road (horses), The Second Avenue Passenger Railway (electricity), The Suburban Passenger Railway (electricity) and The Mount Oliver and Knoxville Railway (electricity).

It may be stated that those roads which are here mentioned as being operated by horses will not be so for long, because all of them are now under contract to be changed into electric roads within the immediate future.

The most interesting feature of the Pittsburgh street railway lines does not consist, however, in their great number, but in the fact that nearly every street railroad which has changed its motive power has adopted a different system of rapid transit. Thus we find almost all the different electric street railway systems, from the Westinghouse gearless motor clear through the list, represented in this city. The opportunity, which will, therefore, be afforded to the guests of the convention for examining into the different systems of rapid transit is literally without a parallel.

In addition to this, however, Pittsburgh is also the home of one of the largest electric street car motor manufacturing companies in the world, namely, the Westinghouse Electric and Manufacturing Company. During the convention, the management of the company has decided to afford all the guests every facility and convenience for visiting the factory, where they may examine and investigate the Westinghouse electric street railway system in all its details. To the practical street railway man, who contemplates the introduction of the electric motor on his own line, or even to those who are already operating an electric road, a visit to the place where these motors are made will certainly prove of interest.

But even apart from these advantages, which especially appeal to street railway men, the city of Pittsburgh affords other opportunities of making a visit to one of the most interesting places imaginable. The city is one of the great workshops of the American continent. It teems with industries of all kinds. Here one can see the manufacture of glassware in all its branches, from the finest plate glass to the ordinary lamp chimney. Pittsburgh is the home of iron and steel mills as large as any in the world. It is here that one can observe the many different illustrations of the utility of natural gas. In fact this city embodies all the features which, for a congregation of men who are keenly alive and interested in the achievements of human ingenuity, go to make up an ideal convention city.

FIG. 1.—PITTSBURGH ELECTRIC RAILWAYS—VIEW OF INTERIOR OF POWER HOUSE OF THE PITTSBURGH, ALLEGHENY & MANCHESTER STREET RAILWAY.

THE PITTSBURGH, ALLEGHENY AND MANCHESTER TRACTION COMPANY.

This is one of the oldest street railway companies in Pittsburgh. It was originally called the P., A. and M. Passenger Railway Company, and included four lines, running from Pittsburgh to Allegheny. While operating with horses about 5,000,000 passengers per year were carried. The road has been recently equipped with electricity, and it is expected that, at least 10,000,000 passengers per year will be carried from now on.

The road is equipped throughout with Thomson-Houston apparatus, installed under the direction of Mr. G. F. Greenwood, one of that company's ablest experts. The overhead construction is especially fine. The trolley line and feed wires are drawn into straight lines, with no sag appearing from pole to pole.

The road starts with 66 cars, including 40 eight-wheel Pullman cars equipped with new Thomson-Houston motors, two of 15 horse-power each to each car. McGuire trucks and Allen paper wheels are used on these large cars.

The power house of this road is located on Juniata street, on the banks of the Ohio river. The steam equipment consists of eight Wetherill boilers, aggregating 1,200 horse-power, and two 500 horse-power Wetherill compound condensing engines. Two more Wetherill engines of 250 horse-power each are now being installed. Natural gas is used for fuel, although a stock of coal is kept on hand for emergencies.

The station is equipped with two 325 horse-power Thomson-Houston generators, coupled directly by insulated clutches to the large engines. These engines also operate a line of shafting which transmits power to six 100 horse-power Thomson-Houston generators. Munson belting is used throughout the plant, there being over 200 feet of 48 inch belt.

The power house is a handsome brick building trimmed with white stone, and has a slate roof supported by iron trusses manufactured by the Keystone Iron Bridge Company, of Pittsburgh.

The car barn of this company is located at the corner of Beaver and Island avenues. It is a handsome brick, stone, slate and iron building, similar in construction to the power house. It has a capacity for 50 cars, and is provided with pits so that 12 cars may be repaired at one time. A large horse barn on the west of the new car barn is to be made over into a storehouse for 20 cars, repair shops and motormen's room.

Mr. J. H. Dalzell is president of this company, and is a man of great experience in street railway affairs. Although the road has been in active operation but 20 days, everything is running smoothly, owing to the excellent supervision and management of Mr. Dalzell and Mr. Greenwood, who engineered and supervised the construction of the road.

THE DUQUESNE TRACTION COMPANY.

This company operates about 30 miles of road, equipped by the Thomson-Houston company. The company formerly operated 60 large cars, but have decided to use small cars, owing to heavy grades on the road, and have placed an order with the Brill company for them. About 15 small cars are now running.

The power station of this road is equipped with two 600 horse-power Wetherill-Corliss single engines, and one 500 horse-power Wetherill-Corliss double engine. There are also ten 200 horse-power Wetherill boilers and two Wetherill feed water heaters.

Power for the line is generated by 17 Thomson-Houston generators of 100 horse-power capacity each. Besides this, there are two 30 horse-power exciters and one 20 light Thomson-Houston arc machine. Over the entire generator platform is a Yale & Towne traveling crane of five tons capacity, operated by hand power.

This building is of brick, with slate and iron roof. The boiler room is separate from the engine room. The smokestack is square in form and 125 feet high. Each of the engines is connected to a countershaft by a 48 inch Munson belt. There are three countershafts, over which the generators are directly placed. The belts are tightened by an idler raised and lowered by a chain hoist.

Oil is being used as fuel, this forming quite a novel feature of the plant. The furnaces have been designed by J. E. Smith, the chief engineer of the Duquesne company, and so far the results have been very flattering. The plant is situated at Ben Venue station on the Pennsylvania Railroad.

The car house of the Duquesne Traction Company is a brick building 400x125 feet, with an iron truss roof covered with slate, situated at Bellfield, near Pittsburgh. The capacity of the station is sufficient to hold about 90 cars.

The Thomson-Houston company's motors and apparatus have been used throughout the entire system. Each car has two 15 horse-power double reduction motors.

Connected with the car barn and forming a part of the building is a very complete repair and machine shop.

The average rate of speed on this line is somewhat higher than that ordinarily made, the cars running 12½ miles per hour. This includes all stops and starts and is, in fact, the average schedule time.

The road-bed is one of the best in Pittsburgh. A Wharton rail of a new section, a compromise between a girder and a groove rail, is used. This is laid on cast-iron chairs and these chairs rest on 6x8 oak ties. Each tie is imbedded in concrete made of Louisville cement, about 12 inches in thickness.

This line work has been put up with a view to permanence rather than economy. The Thomson-Houston company's devices and line equipment have been used. American Circular Loom Company's feed wire and Walworth poles of a new pattern are features of interest. The poles are set six feet in the ground in Portland cement. The following is the cost per pole:

Pole, trimmings, etc.	$30.00
Handling one pole	37½
Labor of setting one pole	2.32½
Cost of concrete	2.00
General expense	30
	$35.00

The poles weigh 800 pounds apiece. The concrete consists of one part Portland cement, two parts sand, five parts broken stone, making five and one-half parts of mixed concrete.

This road is a fine example of what can be done in overhead construction work, and might serve as a model to larger cities than Pittsburgh.

FIG. 2.—EXTERIOR VIEW OF POWER HOUSE OF THE PITTSBURGH, ALLEGHENY & MANCHESTER STREET RAILWAY, PITTSBURGH.

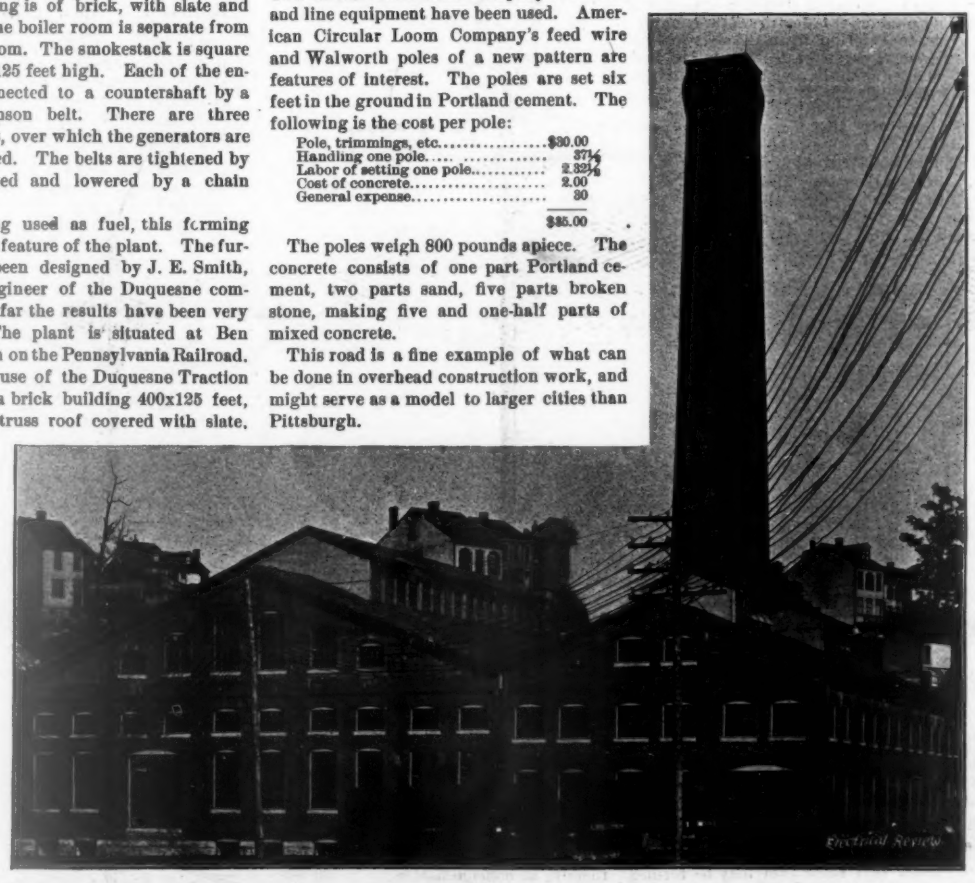


FIG. 3.—VIEW OF EXTERIOR OF POWER HOUSE OF DUQUESNE TRACTION COMPANY, PITTSBURGH.

OTHER PITTSBURGH STREET RAILWAYS.

Another old street railway in Pittsburgh is that of the Citizens' Traction Company. Two years ago the motive power was changed from horses to cable. Under the old system, when horses were used, from 5,000,000 to 6,000,000 passengers were carried per year. Now there are from 12,000,000 to 13,000,000 carried over the road per year.

The Pittsburgh Traction Company's road was built by Philadelphia capitalists, including Messrs. Widener and Elkins. It never paid as a horse road, and has recently been equipped with cable power.

The Pittsburgh and Birmingham Traction Line was built by H. Sellers McKee, Murray H. Verner and others. The company operates the road by electricity, using 20 Short cars and 10 cars of the Edison system.

The Central Traction Company is a cable road which runs to Minersville.

The Second Avenue Electric Road operates about 15 Thomson-Houston cars and five Westinghouse cars. The company expects to add one S. R. G. Thomson-Houston car very soon. The power house is equipped with five 80 horse-power Thomson-Houston generators.

The Pleasant Valley Passenger Railway Company has a capital of $1,300,000, and operates about 50 cars on the Sprague system.

The West End Passenger Railway Company have applied for an ordinance to change from horses to electricity.

The Allegheny Traction Company holds a very valuable franchise on account of its ability to give easements to other roads. The Central Traction Company, the Pleasant Valley road and one or two others, occupy the tracks of this company under easements. This road is now operated by horse-power, but it is probable that electricity will be adopted in the near future. Mr. Geo. B. Hill is president of the company, and Messrs. McKee, Dalzell and Rhodes are prominently interested.

THE WESTINGHOUSE GEARLESS MOTOR.

The greatest activity is shown at the factories of the Westinghouse Electric and Manufacturing Company. In fact, the employés are kept at work all day and a part of the night. Especial activity is shown in those departments where the new Westinghouse gearless motors are made. Since this machine was described in the ELECTRICAL REVIEW a number of improvements have been made, both as regards its mechanical perfection and the insulation of the armature. Two cars equipped with this motor have been in daily operation on the Pleasant Valley line for six months and have given entire satisfaction. There is absolutely no noise, and the new gearless motor has been found fully as economical in consumption of current as the Westinghouse S. R. G. motor.

There are now a large number of the gearless motors in course of construction at the Westinghouse shops, and the manufacturing facilities have been so arranged that from eight to ten gearless motors can be turned out every day.

Los Angeles, Cal., will probably be the first city to be equipped to a large extent with Westinghouse gearless motors. Forty of these machines have been ordered for that place and two have already been shipped.

The progress the Westinghouse company has made during the past eight months, especially in its street railway department, is truly marvelous and speaks volumes for the management. All this has been done in the face of the most adverse circumstances, but this is now all cleared away and the future of a great business is fully assured.

Pittsburgh, October 14. S. L. C.

GENERAL NOTES.

We have received from Mr. Allen R. Foote, special agent of the Census Office, a copy of the blank for the report of street lighting by arc lamps, printed as recommended by the National Electric Light Association at its last convention.

The Central Electric Company, of Chicago, feel happy over the fact that their sales of Packard high grade incandescent lamps are constantly increasing, and report that there is a great tendency towards using better material in electric light construction. These lamps are said to satisfy the most exacting demands.

It is stated that the subscription for the new stock of the Westinghouse company was quite ample. There will be few manufacturing concerns in the country left in a better condition, with no floating debt, a plant in splendid condition, fully able to handle a large and rapidly growing business and quick assets of over $3,000,000, not counting the $1,000,000 capital stock left in the company by the reorganization plan for future needs.

Recent sales by the Wainwright company, of Boston, are as follows: Russel & Company, Massillon, Ohio, four heaters, 675 horse-power; Groveton Mills, Groveton, N. H., one heater, 600 horse-power; Nichols Chemical Company, N. Y., one heater, 100 horse-power; New Bedford Manufacturing Company, Mass., one heater, 400 horse-power; Beckett City & Michigan Company, N. Y., one heater, 300 horse-power; Stearns-Roger Manufacturing Company, Denver, Colo., one heater, 200 horse-power; A. M. Holter Hardware Company, Helena, Mont., one heater, 150 horse-power; Arbuckle, Ryan & Company, Toledo, Ohio, one heater, 100 horse-power.

Electricity in the Census.

INTERESTING LETTER OF SUPERINTENDENT PORTER.

The following letter from Supt. Robt. P. Porter, of the United States Census, to Hon. John Noble, Secretary of the Interior, is a fine compliment to the influence of the National Electric Light Association:

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
Washington, D.C., October 5, 1891.

Sir: I have the honor to acknowledge receipt of your communication of date September 30, requesting me to "reconsider and report upon the inclosed memorial of the National Electric Light Association, sent down by the President," together with your reference of a letter from the honorable, the postmaster-general, of date October 1, touching the same subject, and respectfully submit the following information in relation thereto:

The wonderful advancement of the electrical science, both in invention and successful application, occurring during the last decade, induced this office, upon the solicitation of the National Electric Light Association and other interested parties, to institute preliminary inquiry thereinto, being the first investigation of that subject ever made under federal authority, or by any other government. For this purpose Mr. Allen R. Foote, an electrical expert and author of national reputation, and a most worthy gentleman, was strongly endorsed by the National Electric Light Association and a large number of representative firms and public men. He was appointed December 4, 1889, and has been indefatigable in his efforts to push the work to completion.

It is proper to observe, however, that when it was decided to investigate this subject, it was not contemplated that the scope of the inquiry would extend beyond certain defined limits common to the special branches of productive industry. Subsequently, however, upon consultation with gentlemen interested in this subject, the schedules were so broadened as to cover details that were regarded as necessary properly to present the condition of these important industries, and the questions contained in the schedules were approved by the National Association, as well as by electrical experts and others.

Electrical science being a newly applied industry, the cost of the investigation could not possibly be estimated with accuracy, nor even approximated, but as it progressed, the expense, present and prospective, was found to be so great that I felt unwilling to divert funds from other branches of census work, and employ them on behalf of an industry, however important, which would inevitably entail larger outlay than could possibly have been anticipated.

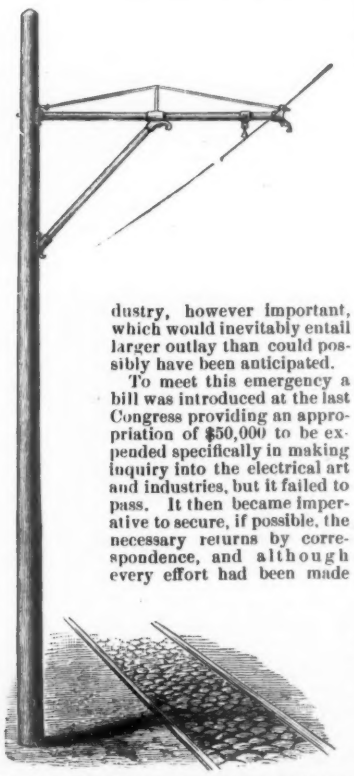


FIG. 2.—No. 2 BRACKET FOR CEDAR POLES.

To meet this emergency a bill was introduced at the last Congress providing an appropriation of $50,000 to be expended specifically in making inquiry into the electrical art and industries, but it failed to pass. It then became imperative to secure, if possible, the necessary returns by correspondence, and although every effort had been made in this behalf, the project did not yield satisfactory results. The reason for this failure is peculiar and anomalous. While the parties engaged in the various branches of electrical industries were entirely willing to supply information called for, they frankly admitted that they did not possess the technical knowledge incident thereto, and hence none but experts could secure the same in any other way save by personal visit to each plant.

Hence, it was determined to postpone further investigation until the Fifty-Second Congress should assemble, thus relieving the Census Office, temporarily, of further expense in the premises, and accordingly an order issued to that effect. Upon the representations, however, of Special Agent Foote, concerning the non-advisability of completely suspending the work, this order has been countermanded. The inquiry will henceforth be conducted by correspondence, so far as the same may be found practicable, with the aid of one special agent in the field.

It should be borne in mind, however, that similar action of temporary suspension was taken with reference to all other special branches of productive industry. It was also found that the outlay required to complete the collection, examination and tabulation of the manufacturing returns was so large as to render it impracticable to assign to this branch a sufficient amount from the funds remaining on hand to complete any part of the statistics of manufactures. Hence, I have been impelled to apply the remainder of the appropriation to the completion of the population statistics and such other branches of census investigation as could, without great expense, be immediately concluded, and meantime defer publishing the statistics of manufactures, simply maintaining the current work of that division until after the meeting of Congress and additional appropriation shall have been secured. No one more than myself appreciates the high importance and value of the investigation into the electrical art and industries in connection with the presentation of census statistics comprising all other productive industries of the country.

Prior to entering upon the electrical inquiry, the division of transportation had been charged with the collection of statistics relating to telegraphs, telephones and electrical railroads, and the division of vital statistics trenched somewhat upon the electric lighting and surgical domain. These inquiries have been eliminated from other divisions, and committed, as an entirety, to the division of manufactures, and assigned to the branch of special investigation into the electrical industries, thus materially adding to the cost as contemplated for the original inquiry.

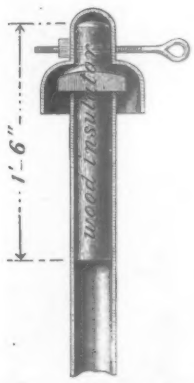


FIG. 3.—SECTION SHOWING INSULATOR AND CAP.

In order that some idea may be formed of the great extent and value of the work now involved in the census inquiry concerning electrical industries, it may be important to state that there have been prepared for the collection of statistics for the electrical industries for the Eleventh Census, 19 schedules and as many supplements, covering the following subjects:

1. Schedules for preliminary information. 2. Schedule for electrical institutions giving a course in electrical engineering. 3. Electric light and power stations. 4. Manufactures of electrical apparatus and supplies. 5. Isolated electric light and power plants. 6. Commercial telegraph companies. 7. Commercial telephone companies. 8. Steamboat electric light and power plants. 9. Municipal electric light and power stations. 10. Uses of electricity in medicine and surgery—manufactures of apparatus. 11. Uses of electricity in medicine and surgery—medical colleges. 12. Uses of electricity in medicine and surgery—hospitals. 13. Uses of electricity in medicine and surgery—physicians. 14. Municipal fire alarm telegraphs. 15. Municipal police patrol telegraphs. 16. District messenger companies. 17. Uses of electricity in mining. 18. Telegraph lines used by steam railroad companies. 19. Electric street railroads.

There have also been issued about 50 different forms of printed letters of inquiry and transmittal, besides numerous typewritten and form letters.

In addition to the statistics provided for by these schedules, statistics are to be collected by letter or by personal application on the following subjects:

1. Scientific electrical instruments. 2. Ocean telegraphs. 3. Electrical distribution of time. 4. Uses of electricity by the United States government. 5. Electrical tabulating machines and registers. 6. Electroplating. 7. Electro-metallurgy. 8. Electric welding. 9. Special uses of electricity by steam railroads, such as: (*a*) Telegraphing from moving trains. (*b*) Special uses of the telephone. (*c*) Block and road crossing signals. (*d*) Electric headlights. (*e*) Electric train brakes. (*f*) Electric train lighting. (*g*) Uses of electric motors for separating drawbridges, turn-tables, traveling cranes, hoists and telpherage. 10. Electrical patents issued by the United States.

All advices received by me concerning the inquiries comprised in the schedules prepared under the direction of Special Agent Foote express the conviction that they are skillfully drawn and thoroughly adapted to the purpose. It is also indicated that the parties employed in the development of electrical invention and industries will interest themselves therein, and cheerfully make response thereto, a consummation of supreme importance to the census office. The memorial and other papers are herewith returned.

Very respectfully,

[Signed] ROBERT P. PORTER,
Superintendent of Census.

HON. JOHN W. NOBLE,
Secretary of the Interior.

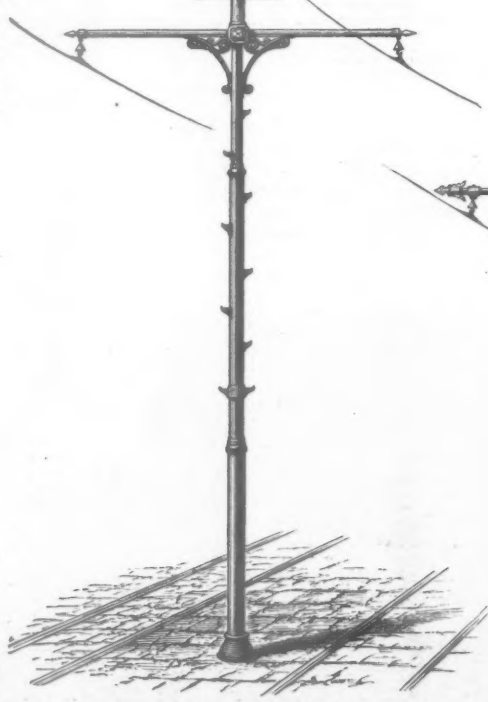


FIG. 4.—CENTER POLE, WITH HOOD FOR ARC LAMP.

Poles of Steel and Iron for Electric Street Railways.

The Walworth Manufacturing Company, Boston, Mass., one of the largest and among the most prosperous of New England manufacturing enterprises, has acquired a widespread reputation throughout this country and abroad for reliability and excellence of its products.

During the past three years the Walworth Company has given special attention to the manufacture of poles of steel and iron for electric street railways, and the accompanying illustrations show a few of numerous styles of pole which the company has furnished to street railway companies, a few of which are the following: West End Railway Co., Boston, Mass.; Linden Street Railway Co., St. Louis, Mo.; St. Paul City Railway Co., St. Paul, Minn.; Minneapolis Street Railway Co., Minneapolis, Minn.; United Electric Railway Co., Nashville, Tenn.; Fulton County Railway Co., Atlanta, Ga.; Troy & Lansingburgh Street Railway Co., Troy, N. Y.; Eckington & Soldiers' Home Railway Co., Washington, D. C.; Brooklyn & Coney Island Street Railway Co., Brooklyn, N. Y.; Union Depot Street Railway Co., St. Louis, Mo.; Georgetown & Tenallytown Railway Co., District of Columbia.

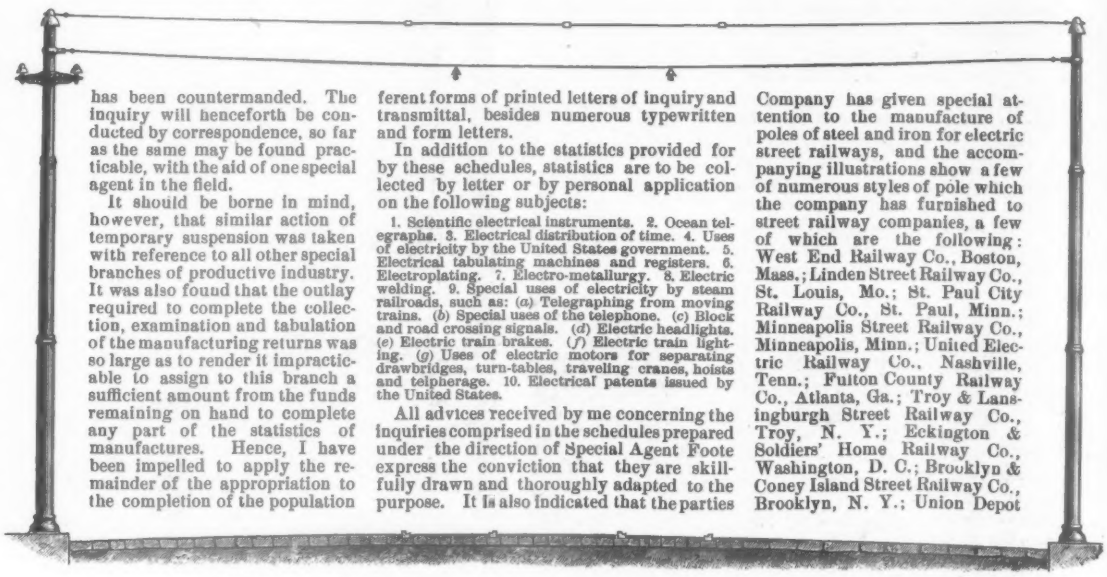


FIG. 1.—WALWORTH POLE FOR SPAN WIRE SYSTEM—EXTRA STRONG PIPE.

Among the prominent electrical manufacturing companies with whom the Walworth people are doing an extensive business in the line of poles for suspending arc and incandescent wires, or for constructing either the single or double trolley system for electric railways, are the following: Thomson-Houston Electric Co., Sprague Electric Railway and Motor Co., United Electric Traction Co., Short Electric Railway Co.

The Walworth Manufacturing Company manufactures its steel and iron poles of any special patterns that may be designed, and all orders are promptly filled, owing to the company's extensive factory and enormous manufacturing facilities.

As previously stated in our columns, the company will make a large and varied exhibit at the Pittsburgh convention of its steel and iron poles for electric street railways. Col. L. R. Greene, manager of the company's pole department, will be present at the Street Railway Convention, and will have charge of the exhibit to be made by his company.

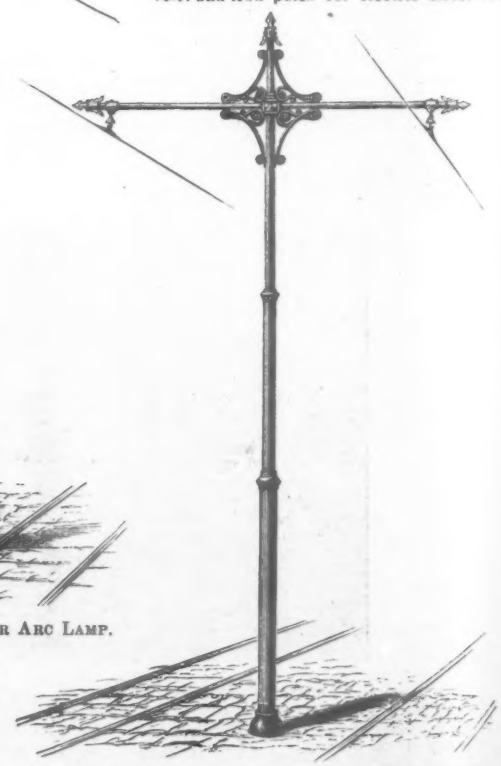
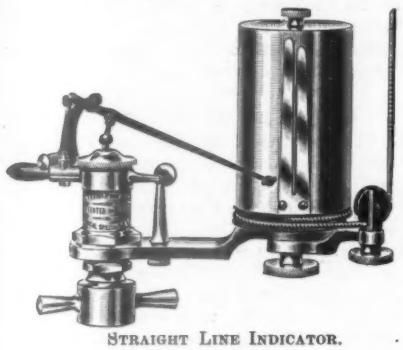


FIG. 5.—CENTER POLE, WITH WROUGHT IRON ORNAMENTAL BRACKETS.

The Straight Line Indicator.

The peculiarity of this indicator lies in the simplicity of its parallel motion and in the auxiliary spring, by which it is held up to one working surface and thus prevents the appearance of any back-lash. The guiding mechanism for the parallel motion is placed as near the fulcrum as possible, to obviate the great amount of movement as found in other indicators, and to be where the momentum will be the least. For a card of average height, a sideways movement of not more than one-eighth of an inch is necessary to oblige the pencil to move in a straight line, and for so slight a movement very little mechanism should be sufficient. In this indicator it is accomplished by two rocking surfaces, one attached to an upright and the other permanently fixed on the pencil arm. The one on the upright is made circular, and the other of such form that when the lever rises and falls, these two guiding surfaces roll together for a



Straight Line Indicator.

very slight distance and cause the pencil to move in a perfectly straight line throughout its full range. All that is required of the auxiliary spring is to give it sufficient tension to keep these guiding surfaces in contact while the instrument is running. This may be determined by turning on steam while the drum is stationary and noting if the pencil traverses the same vertical line. This spring is intended also to take up all play that may ever appear in the joints and oblige the pencil to always follow in the same path. The first indicator made was subjected to the test of being run continuously nine hours a day on a high speed engine for over a month, and showed no appreciable wear, as what there may have been was taken out by the auxiliary spring and the instrument improved if anything by this hard usage.

The effect of the auxiliary spring on the main spring is to weaken it. This allowance is made in numbering the spring, and the scale of spring, therefore, is the net resistance of the two springs.

The moving parts of the instrument are the lightest weight of any straight line indicator, and that weight is disposed so near the fulcrum that its little movement makes the momentum very little and specially adapts it for the highest speeds. Messrs. Hine & Robertson, 45½ Cortlandt street, New York, control this invention.

A Receiver Appointed.

Thomas F. Stevenson has been appointed receiver for Stanley & Hall, manufacturers of electrical supplies at No. 34 Frankfort street, New York. The business was started about 10 years ago by E. W. Hazazar, who was joined by Arthur F. Stanley in October, 1886, and Harry Hall became a partner in March, 1890. The business was turned into a stock company in April, 1890, with a capital stock of $20,000, which was afterward increased to $30,000, the new stock being taken, it was said, by Sheldon H. Bassett, of Birmingham, Conn., who became vice-president. Royal A. Bassett, the latter's father, it is said, lent the company money which was secured by a chattel mortgage for $10,000, in August last. The receivership, it is said, is in the interest of Mr. Bassett. The company, it is reported, has about $12,000 unsecured debts, and there is due it about $14,000 from customers, besides some stock on hand.

Mr. A. F. Stanley, of this company, is widely known in electrical circles, and his many friends hope soon to see him overcome all this trouble, which is, no doubt, temporary.

The Merchants' Electric Light Company, of Philadelphia, have decided to use the patent conduits of creosoted wood tube, manufactured by Frank T. Wycoff, of Williamsport, Pa. The company has the right to lay all of the underground conduits in Philadelphia.

Something New in the Railway Line.

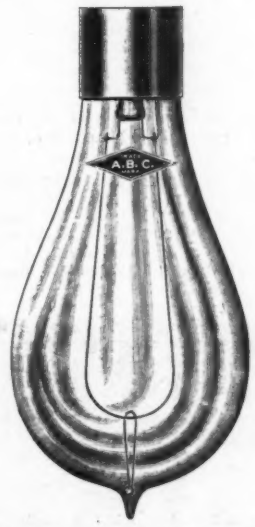
The constantly increasing importance of the electric railway industry demands the invention and manufacture of special appliances apart from such as are absolutely and fundamentally necessary for its operation.

Among the most important accessories of electric railways, car illumination has a prominent place. Not so much mere illumination, possibly (judging from that in vogue on our local street and elevated roads), but economy in cost of apparatus and supplies. This must always be an important item.

As is well known, the incessant vibration of electric railway cars proves disastrous to the incandescent lamps used therein for illumination, the breakage of lamps in some cases proving a very large item of expense. Lamp manufacturers have, therefore, striven to devise means to lessen the breakage, and so render their product more acceptable to railway companies.

The principal means employed heretofore has been a platinum hook or strip placed inside the bulb to steady the carbon. The cut shown herein represents a carbon hook used for the same purpose, now for the first time, we think, placed commercially before the public.

This carbon hook is used only in the "A. B C." lamp. As shown by cut a piece of carbon, little larger than the filament itself, is, before the filament is introduced into the glass bulb, bent around it, and the two ends of this piece are sealed close together by a drop of glass. This glass subsequently becomes a part of the tip of the bulb during the operation of tubing the lamp for exhaustion. The carbon piece, besides being really invisible when the lamp is burning, has the advantage of being to a certain extent flexible; the filament thus suffering less abrasion at the point of contact with the carbon piece, is less likely to wear thin or become dislodged from its connections.



New Electric Railway Lamp.

The homogeneous character of the carbon piece and filament offers another advantage, inasmuch as the filament, when brought in contact with the support, finds itself resisted by a similar material, naturally hotter than would be a metallic support, thus avoiding excessive and continuous changes in temperature. These lamps have already been tested practically with most gratifying results.

At the railway convention in Pittsburgh this week, the corridor of the Monongahela House will be lighted by the "A. B. C." lamps, and Alexander, Barney & Chapin will have several representatives in attendance to show these special railway lamps.

East Liverpool and Wellsville Electric Railway.

After much competition, the contract for electrical equipment to be used on the East Liverpool and Wellsville, Ohio, Railway has been awarded to the Short Electric Railway Company. The road will be about eight miles in length, connecting Ohio City, Wellsville and East Liverpool, with the power station in the last named place. Eighty-two pound Johnson girder rail will be used throughout the entire road-bed, grading for which has been pushed vigorously. A force of 500 men have been at work for two weeks on the road-bed, which has been cut and filled according to the best practice for steam railways, and will, when completed, be practically level. Thirteen acres of ground have been purchased in East Liverpool, on part of which a handsome red brick power station is in process of erection. Power will be furnished by two 150 horse-power Reynolds-Corliss engines with accompaniment of two 300 horse-power boilers and a Worthington duplex pump. Two Short multipolar slow speed dynamos of 150 horse-power each, and a handsome marbleized slate switchboard of the latest Short type, fitted with all necessary appliances for the modern electric power station, will complete the equipment of the power station.

Seven 26-foot car bodies have been purchased of the J. G. Brill Company, Philadelphia. These will be equipped with 14 Short "gearless" motors, having a capacity of 20 horse-power each. Line construction will be Short system throughout.

It is expected that the road will be put in operation on Thanksgiving Day, when the citizens of the two enterprising towns have arranged to decorate their streets and cars and to give a banquet in honor of the occasion. At this writing the usually quiet streets of both East Liverpool and Wellsville are filled with foreign workmen, several hundred men being employed at different points along the line. The greatest enthusiasm has been shown from the start by the people of the two towns, the cause of their hearty co-operation being immediate relief from the steam cars, which have been their only method of communication thus far.

The Edson Steam Recording Gauge.

This valuable instrument is growing in popularity among all steam users, and is meeting with particular success in electric lighting and power stations. It is one of those things that more than pays for itself within a few months after it is put in use, and the REVIEW does not hesitate to recommend it most highly to the electric railway and electric light station men who are constantly seeking for improvements.

Among numerous electrical and other testimonials received by Mr. Edson, is the following from the president of the Diamond Ice Company, of Wilmington, Del., which was written without any solicitation whatever:

JARVIS B. EDSON, ESQ., 87 Liberty street, New York:

DEAR SIR—Without any solicitation from you, I write to say that we are perfectly delighted with the recorders you sent us. They not only afford us satisfaction in providing a positive record of pressures, but to our surprise the effect upon the man who regulates the expansion valves in our factory is most remarkable. The valves are now adjusted with great accuracy, so that the pressure day and night is virtually the same, thus securing great economy in our work.

We are obliged to confess that what we regarded as a luxury when we purchased the recording gauges, we now find to be a necessity to every well managed ice manufactory. Very truly yours,

(Signed) E. T. WARNER, Vice-President.

Electric Wire Business at Bristol.

The National India Rubber Company, of Bristol, has gone into the manufacture of electric wires, and its lightning conductors and "Narragansett" rubber line wire are becoming favorably known in the electrical world. Twenty-five years of experience with india-rubber has given the company a thorough and minute knowledge of the manipulation of rubber in all its branches, and its application as insulation for electric wires is no new thing with them, for 18 years ago they applied rubber covering to wires for their own use, which wires are in use to-day with unimpaired insulation. For a number of years Colonel Eddy and other officers of the company have been experimenting with rubber insulation, in conjunction with electrical experts, in the endeavor to produce a superior insulating covering. The Massachusetts Electrical Engineering Company has been associated in some of these later tests. This Summer the wire has been put upon the market, the company appealing to the best trade, with the gratifying result that this department of the works is kept busy. The National india rubber insulation possesses high insulating qualities and is claimed to be less susceptible to the destructive influences of heat, cold, moisture and gases, than that used by other companies. Pure lake copper and fine Para rubber are used. The rubber covering is first pressed around the wire in a semi-plastic form, making a seamless covering, considered an important advantage over insulation having a seam on one or both sides. It is then wound with rubber tape and covered with a braided weather-proof outer envelope. The whole insulation is then vulcanized, all the wire being at present made with a black finish, although white braided coverings will soon be put on the market. The New England Butt Company's taping and braiding machines are used. Solid conductor electric line wires are made from No. 00 to No. 20, with a standard insulation resistance of 1,000 megohms per mile. Standard conductor light wires, flexible switch cords and rubber line wire are also made in all the sizes called for. A quantity of the wire is in use in the New York subways. Mr. Frederick S. Minott is general manager.

The Creaghead Trolley Line Insulator.

The glass insulator screwed on the wood pin has been used in all electrical line work for years. The wood acting as a cushion, adapts itself to any condition arising from

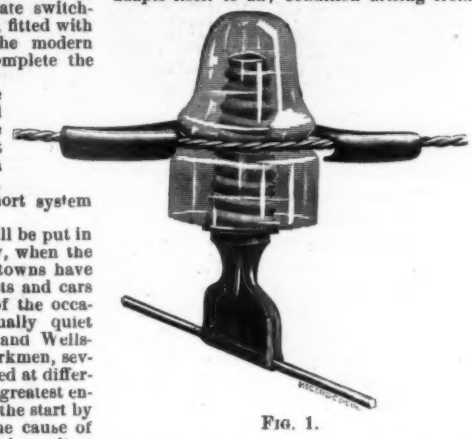


Fig. 1.

unequal expansion of the wood and glass, and thus securing the glass insulator against breakage. The Creaghead Engineering Company, of Cincinnati, have designed a glass insulator, as shown in Fig. 1. This insulator consists of a grooved glass insulator into which is screwed a wooden plug. The bolt has a round head at the top and a thread at the bottom and is screwed into the clamp.

The method of connecting the insulator to the span wire is very simple and secure. The yoke shown in Fig. 2 fits loosely in the groove of the insulator, as shown in Fig. 1. The inner curve of the yoke, coming in contact with the insulator, is a half circle, with a slightly larger radius than that of the smallest circle of the groove. It is necessary to remove the yoke from the insulator about three-quarters of an inch before it becomes disengaged from the groove. The yoke can be put on and taken off of the span wire easily and without tools. All strains on the insulator tend to increase the hold of the yoke and span wire on the insulation. While the attachment of yoke and trolley wire is secure it is at the same time flexible, and will adjust itself to unequal expansion of materials.

Fig. 2.

The action of this insulator where in use comes fully up to the company's expectations and the result is very encouraging.

Hunt Engineering Company Moves to New York.

The Hunt Engineering Company, of which Geo. W. Hunt is president and treasurer and Albert E. Rich, secretary and general manager, has moved from its office in Brooklyn to No. 126 Liberty street, New York, where enlarged and more convenient quarters have been obtained. This company reports an increase of business as the result of the Fall trade, and, while its affairs have been a little disarranged through the severe illness of its president, Mr. Hunt, who, we are pleased to state, is now improving, will soon be nicely established in the new office.

Thomson-Houston.

The Thomson-Houston Electric Company has advices through its London agency, says the *News Bureau*, of an important sale of Thomson-Houston electric light apparatus in Calcutta.

The sales of the Thomson-Houston Company for September, 1891, were $1,174,000 and for September, 1890, $817,000, an increase of $357,000.

The sales for the months of July, August and September, 1891, amounted to $2,995,831, as against $2,417,406 for the same period in 1890; increase, $578,425.

* * The Abington, Mass., and Rockland Electric Light and Power Company is to start its lights on December 1. The capital stock of the corporation is $30,000.

* * An electric railway company has just been organized at Scottdale, Pa., to build a road from that town to Broadford, and application has been made for a charter.

* * A movement is on foot to construct an electric railway from the southern terminus of the South Broadway Electric Road in Denver, Colo., to Littleton, a distance of about seven miles.

* * The Sherman, Texas, council has granted the city railway company right to change to electric power. This, in connection with the rapid transit line, will give that city over 10 miles of electric railway.

* * The Alamo Electric Company, of San Antonio, Texas, was placed in the hands of a receiver last week. The liabilities and assets are not given. The company operates about 20 miles of street railroads in that city.

* * The council at Hartford, Conn., has concurred with the aldermen in granting the street car company permission to erect poles and wires through State, Market and Morgan streets for electric power for their cars.

* * The Electric Merchandise Company, of Chicago, has issued a beautifully printed invitation to their headquarters at the Monongahela House, Parlor 5, during the meeting of the street railway convention this week.

* * Felix Chappellet, William C. Ames, H. B. M. Miller and Herman de Laguna have presented a formal petition for an electric railway from San Jose to Los Gatos, California. The petition was accompanied by the required check for $50.

* * It is reported that a stock company, backed by Eastern capital, has been formed, who will put in and operate an electric street car line through and between Moorhead and Fargo, Minn. If the company can secure franchises from the two cities the line will be put in this Fall.

* * Joseph A. Corby has been engaged in building electric street railways in Denver and other Colorado cities. Mr. Corby states that he has seven miles more of road to build in Denver, when he would be done and return to his home at St. Joseph. He has constructed 17½ miles of electric street railway in Denver since last Spring.

* * Ball Engine Company, Erie, Pa.—The Palace Hotel, San Francisco, Cal., has ordered a 200 horse-power Cross compound engine for their electric light plant. The Palace Hotel is now using a 100 horse-power tandem compound engine, manufactured by the Ball Engine Company with satisfaction. The Patent Brick Company, San Francisco, Cal., has ordered a 150 horse-power tandem compound condensing engine, one 200 horse-power Stewart purifier and heater, and one 200 horse-power Wheeler independent pump and admiralty surface condenser. Mr. H. Bloomfield, San Francisco, Cal., has ordered a 150 horse-power compound condensing engine. Mr. E. G. Gilbert, Atchison, Kan., representative of the Ball Engine Company, is erecting a 40 horse-power steam plant consisting of a 40 horse-power engine, boiler, heater, pump, etc., for the Norfolk Street Railway Construction Company, Norfolk, Neb. He has also set up a 35 horse-power engine for the Norfolk Beet Sugar Company, Norfolk, Neb. The Ball Engine Company has shipped the World's Fair one 60 horse-power engine for operating the incandescent electric light plant on the grounds.

* * The National Pipe Bending Company, New Haven, Conn., manufacturers of the National feed water heater, report the sales of over 100 of the National heaters during August and September, among the sales being seven to Great Britain and one each of varying horse-power to Barytes Mills, New Haven, Conn.; Pairpoint Manufacturing Company, New Bedford, Mass.; Gastonia Cotton Manufacturing Company, Gastonia, N. C.; Garfield Mining and Manufacturing Company, Garfield, Ohio; New Brighton, Pa.; Central Forge Works, Whitestone, L. I.; "Colonial" Club, New York city; National Chair Manufacturing Company, Phoenicia, N. Y.; Central Thomson-Houston Company, Versailles, Ky.; U. S. Navy Yard, Charleston, Mass.; State House, Trenton, N. J.; Georgia Electric Light Company, Atlanta, Ga.; Hartmann Electric Light Company, Duluth, Minn.; Waltham Gas Light Company, Waltham, Mass.; United Coal and Coke Company, Tarr, Pa.; Crown Mills, Marcellus, N. Y.; Combination Roll and Rubber Company, Bloomfield, N. J.; Hartford Rubber Works Company, Hartford, Conn.; Charlotte, N. C.; Salem Electric Light Company, Salem, Mass.; British Guiana Light and Power Company, Georgetown; Hartford Carpet Company, Thompsonville, Conn.; Austin Water, Light and Power Company, Austin, Tex.; two to U. S. Treasury Building, Washington, D. C., and Boston Electric Light Company, Boston, Mass., and three of 150 horse-power to East River Electric Light Company, New York.

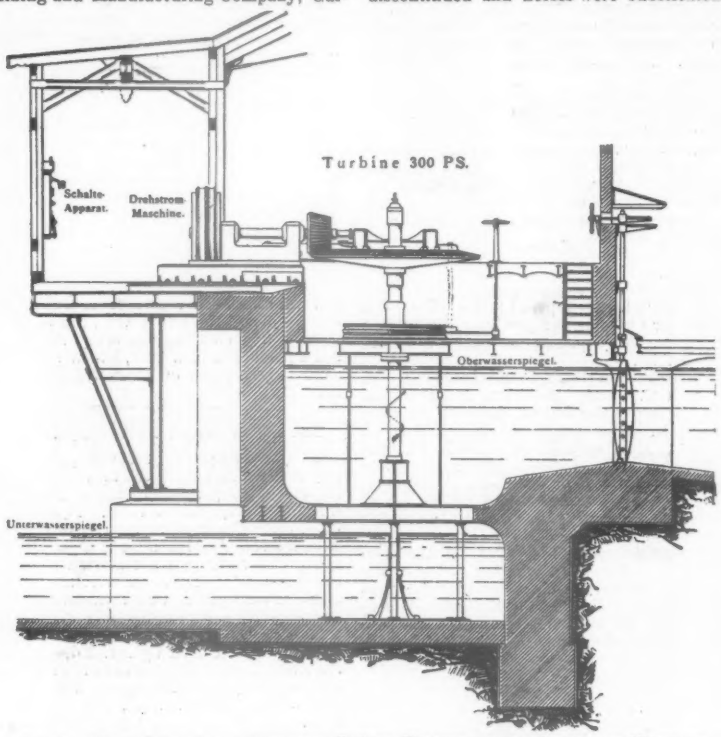


FIG. 1.—HEILBRONN LONG DISTANCE POWER TRANSMISSION—SECTIONAL VIEW OF TURBINE AND GENERATOR AT LAUFFEN.

The Old Lady, the Conductor, and the Electric Car.

The electric cars that used to run in Montgomery street, Jersey City, were recently discontinued and horses were substituted. An old lady from back near the West Side driving park stepped on one of the horse cars at the stand at Bergen avenue yesterday.

"Is this an electric car?" she asked the conductor.

"It is, madam," answered the conductor, without a blush. The old lady sat down and looked at the horses and then at the driver, and finally back at the conductor.

"Be you sure this is an electric car?" she asked again.

"Of course I am, madam," said the conductor.

The old lady looked at the horses again and then back at the conductor, and said, in a tone that indicated disgust:

"Them's horses; they ain't electricity."

"Madam," said the smart conductor, "the objects you see attached to this car are not horses, but good imitations of the animal. They are the motors. The electricity is in them. Now, you will notice when the man there pulls on the lines the car starts. Those lines he holds are attached to buttons, and every time they are pulled those buttons are pressed. Then the electricity does the rest."

"Oh!" exclaimed the old lady, admiringly. Never was a team more closely watched than was that team coming down the hill. The old lady got off at Barron street, remarking to the smart conductor as she did: "Young man, flies bother electric motors the same as horses, don't they? Do you think they's any on me?"—*New York Sun.*

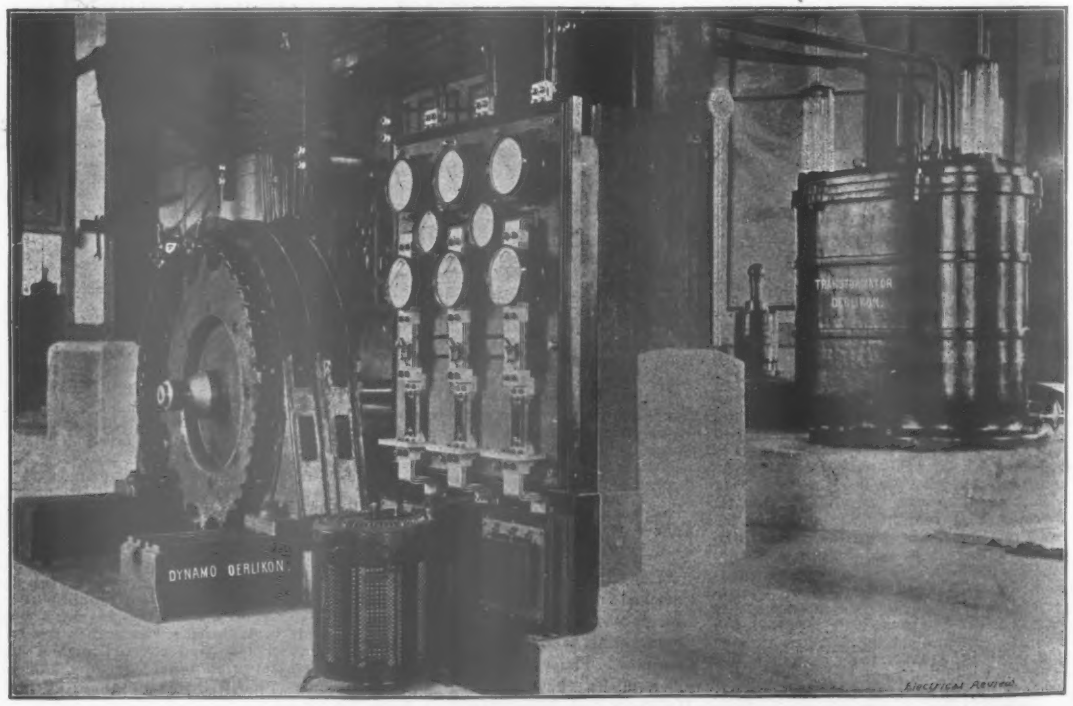


FIG. 2.—MULTIPHASE GENERATOR, REGULATOR AND TRANSFORMER AT LAUFFEN—FROM PHOTOGRAPH BY OUR SPECIAL CORRESPONDENT.

Mr. Leonard's New Motor Device.

H. Ward Leonard & Company now have on exhibition at their offices in the Electrical Exchange Building, 136 Liberty street, a Crocker-Wheeler motor operating under Mr. Leonard's new principle for controlling the speed, torque and direction of motors. The motor is made to perform various work in such a manner as to clearly show the principle used and the facility with which either the speed or torque is controlled. The exhibition is extremely interesting.

Electricity at the World's Fair.

The Department of Electricity of the World's Columbian Exposition is making every effort to secure, among the exhibits in the electrical line, a complete collection of historical apparatus.

Chief Barrett's assistant, Mr. E. E. Keller, has the matter in hand and has opened correspondence with parties supposed to have in their possession various apparatus of this kind. The intention is to secure apparatus used by the old scholars in their researches, and to combine this in an exhibit showing the progress of the science from as early a date as possible. There is, doubtless, considerable apparatus of this nature in existence in Europe and in America, and the problem is to get possessors of such apparatus to place it at the disposal of the department of electricity. Mr. Keller is fully aware that this is no easy task to accomplish, and he is anxious to have all persons having a knowledge of the existence of anything in the line of electrical apparatus, communicate with him and aid him in the location of apparatus of interest.

The construction department is now perfecting plans for the location of restaurants, lavatories, cloak rooms and offices in the electricity building, for the consideration of Chief Barrett and his assistant. The locations of these conveniences have not yet been definitely settled upon, but the matter will probably be settled in a few days.

Electrical Power Transmission from Lauffen to Heilbronn, Germany.

AN ACCOUNT BY THE "ELECTRICAL REVIEW'S" SPECIAL CORRESPONDENT.

The right of establishing an electrical plant at Heilbronn has been given to the Portland Cement Works, of Lauffen. This company's works are situated about 12 kilometers (about 7½ or 8 miles) from Heilbronn, and they have water power at their disposal of about 1,500 horse-power, of which 600 horse-power is used by the cement

FIG. 3.—TRANSFORMER.

works and 900 horse-power will be used for light and power purposes in Heilbronn.

This station will be provided with machines giving ("mehr phasige wechselstrom") multiphasal alternating currents, so-called "Drehstrom" machines. This is the first commercial plant to be equipped with this type of apparatus. It is the same as is now being used in transmitting the 300 horse-power from Lauffen to the Frankfort Exposition. In fact, the same apparatus will probably be used at the station in Lauffen.

These multiple phasal alternating machines are well adapted for use with small motors, and this will represent the greater part of the load at Heilbronn.

The changing of alternating currents into continuous currents to charge an accumulator plant will not be necessary in this case, as the water power is exceptionally cheap, and plenty of water is available to more than supply all the power the city of Heilbronn is expected to use in this way. Of the three turbines now installed only one of 300 horse-power will be used to drive the "Drehstrom" alternating current machinery at present.

The dynamo and transformer built by the Oerlikon Company, of Zurich, may be seen in the accompanying views, and Fig. 1 shows the plan of turbines and "Drehstrom" machines.

These machines produce a current of 4,000 amperes at 50 volts pressure and is transformed to 39 amperes at 5,000 volts. This transformation is to be preferred to a machine which produces directly high potential, because the machines giving low potential are not only more easily insulated and safer to handle, but have a much higher capacity than machines of very high voltage. So that although a loss of about three per cent. is incurred by this transformation, it is more than compensated by the increased capacity of the machines.

From the transformer the current is conducted on three bare copper wires six millimetres in diameter to the city limits at Heilbronn. The wires are strung on poles from 8 to 14 metres high and the wires must be at least one metre above the highest fruit trees growing along the road. The insulators are made of porcelain and the cup is filled with oil. The barbed wire at the top of the poles is used as a lightning protector, as the engineers claim it is the best protection for overhead lines, as experience has shown in their work in Switzerland.

The transformer station is just outside of the city limits of Heilbronn and here the overhead wires end. The current is again re-transformed from 5,000 volts to 1,500 volts. This reduction of potential before the entrance to the city is necessary, because the wires in Heilbronn are to be placed underground, and no underground cable has been found by the engineers to stand this high voltage.

On this circuit, carrying current at 1,500 volts, are placed secondary transformers which reduced the potential from 1,500 volts to 100 volts. (See Fig. 5.)

Fig. 3 shows the transformers used for reducing the pressure from 1,500 volts to 100 volts. Fig. 2 shows the generator, regulating apparatus and stop up transformer. Fig. 4 shows one of the rotary current or "Drehstrom" motors.

From these transformers the current is distributed to the consumers in Heilbronn. The total loss in the 12 kilometres between the connected transformers is only 20 per cent., so that of the 200,000 watts generated at Lauffen, 160,000 watts are delivered to the consumers in Heilbronn, which may be used to light 3,200 incandescent lamps of 16 candle-power each, or a current equivalent for arc lamps and motors. As not all of the lights are used at the same time, the apparatus will supply a total installation of 4,200 16 candle-power lamps.

The total cost of the plant, including land and water front, will be about 375,000 marks, or $95,000, so that the cost of installation will not exceed 90 marks per lamp. The opening of this central station at Heilbronn must take place before the end of November, 1891, according to contract. Already 1,000 incandescent lamps, 25 arc lamps and seven electric motors, have been contracted for by consumers in Heilbronn.

The turbines were supplied by Geislinger Maschinen Fabrik, the dynamo machines and transformers by Maschinen Fabrik Oerlikon, the wires and cables by Siemens & Halske, and the switch and regulating apparatus by Algemeinen Electricitäts Gesellschaft, of Berlin.

The 200 horse-power motor shown is the "Drehstrom" motor used at Frankfort Exposition.

P.

Frankfort, Germany, October 3.

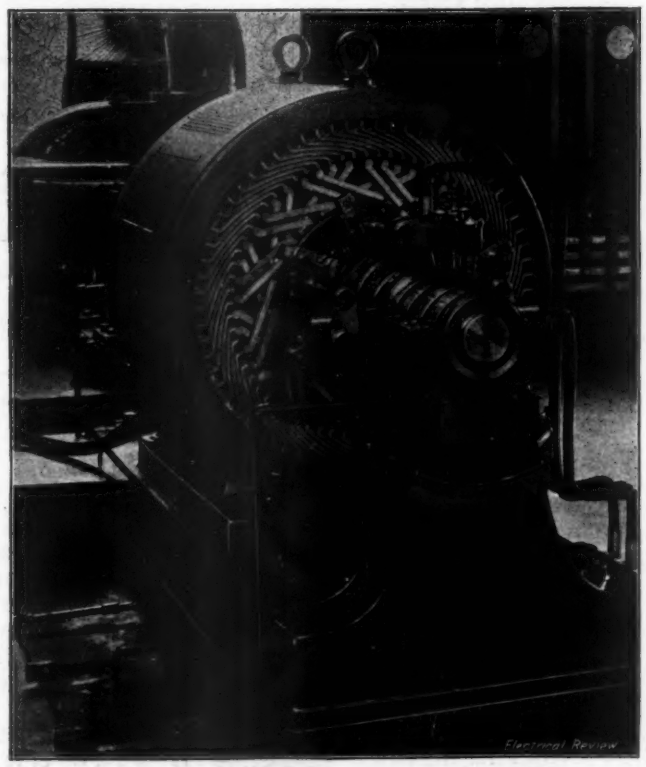


FIG. 4.—HEILBRONN MULTIPHASE OR ROTARY CURRENT MOTOR.—PHOTOGRAPHED BY OUR SPECIAL CORRESPONDENT.

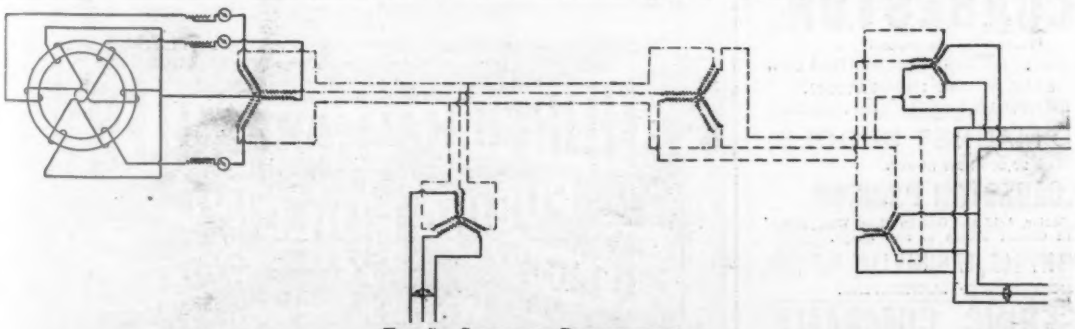


FIG. 5.—SYSTEM OF DISTRIBUTION.

PERSONAL.

Mr. A. R. Knight, well known in electrical circles in Boston, has been appointed auditor for the New England department of the Edison General Electric Company.

L. K. Perot, lately with the Thomson-Houston Electric Company, has accepted the position of assistant engineer of the Equitable Engineering and Construction Company, of Philadelphia.

His many friends and acquaintances will regret to learn that Mr. Joseph Wetzler, one of the editors of our esteemed contemporary, *The Electrical Engineer*, is down with quite a severe illness, the result of overwork. It is sincerely to be hoped that Mr. Wetzler will quickly recover his health.

A very large circle of friends of Mr. Herbert Montague Linnell will be pleased to congratulate him over his marriage, which occurred quietly in Yonkers, September 21, at St. John's church. The happy bride was Miss Jane Baldwin. The ELECTRICAL REVIEW most sincerely congratulates Mr. Linnell.

ELECTRIC LIGHT NEWS

—— Wellsville, N. Y., is to have an electric light plant put in by the water company of that city.

—— The West Newton, Pa., Electric Light and Power Company will spend $55,000 on an electric plant.

—— A local company of New Brighton, Pa., has secured the contract for lighting the streets at $59 per light yearly.

—— E. Bement & Sons, of Lansing, Mich., have equipped their works with an Edison incandescent plant of 400 lights.

—— The Southbridge, Mass., Gas and Electric Company has declared a 3 per cent. semi-annual dividend, payable on and after October 15.

—— The common council of Marquette, Mich., has passed an ordinance abolishing the electric light commission there, taking the control of the lighting service into their own hands.

—— Cambridge, N. Y., will soon have the benefit of electric lights, as the contract has been awarded to Bernard & Company, of Troy; 500 incandescent lights will be the first installment.

—— The electric light business has now been settled at Elizabeth City, N. C. The contract and franchise has been written and signed, and the new company has put up a $200 guarantee to have the plant in operation within 30 days. The boilers, wires, poles, etc., of the old company have been purchased and the affair settled satisfactorily to all concerned.

—— The report in the Boston *Advertiser* that the Thomson-Houston Company is offering $500,000 of its preferred stock is incorrect. The company has no stock, Mr. Coffin says, it can offer without a vote of the stockholders. The report may have started from the fact that the Northwest Thomson-Houston Company has recently closed a subscription to $500,000 of the preferred stock of that company, which was all taken and largely over-subscribed.

—— The Century Pottery Company, 508 to 514 Liberty street, Camden, N. J., have sent us what at first sight we thought was an infernal machine. On opening the package, however, we discovered a handsome specimen of vitrified porcelain neatly packed in a bed of sawdust. On top was a little slip of paper which informed us that this company makes porcelain electrical specialties, devoting special attention to odd shapes and sizes. We tell you about this so that you may get one.

—— Arguments were recently made in the United States district court before Judge Shipman, at Hartford, on a side issue in the suit of the Brush-Swan Electric Light Company and the Brush Electric Company, against the Thomson-Houston Electric Light Company. The Brush-Swan company claims that the Thomson-Houston company has been infringing the Brush patents, and an injunction and accounting is asked for. The arguments this time were on a motion of the Brush Company to strike out its name as a party to the complaint.

—— The Pittsfield, Mass., Electric Light Company is to add a new building to its excellent plant. The call for lights in business houses and residences demands enlargement. A one-story brick building will be erected on the east side of the main building and will be 40x63 feet. Work on it will commence at once and it is to be completed within a month. It will be supplied with a Westinghouse engine, 200 horse-power, and a 1,500 light dynamo. The building will be constructed on the same general plan as the main building. The dynamo is now at the depot and the engine will be shipped Wednesday, so that the addition will be put in operation as soon as the roof is on.

KINDRED INTERESTS

Thomson-Houston System of Arc Lighting.—A very entertaining little catalogue, artistically gotten up, has been received at this office, describing the Thomson-Houston system of arc lighting in plain terms. The illustrations are particularly attractive.

Ed. Ackermann & Company, 45 La Salle street, Chicago, have opened a polytechnical book store. Special attention will be paid to subscriptions for technical publications. The ELECTRICAL REVIEW will always be found on file at the above address, where subscriptions and orders for sample copies may be left.

J. H. Bunnell & Co.—This company's new galvanometer gauge, which was described in the last issue of the REVIEW, is sure to meet with much favor as a reliable standard for measurements of current strength. In the article mentioned the Burnley dry battery was given as indicating "4°," when it should have been 14°. These gauges are especially popular for fire alarm and burglar alarm work.

The Delaware Iron Company, owned and operated by Morris, Tasker & Company, of New Castle, Delaware, have decided to rebuild their plant, which was lately destroyed by fire, and have placed the contract with the Berlin Iron Bridge Company, of East Berlin, Conn., for the entire plant, which will be constructed of iron from the designs of the Berlin company. The work has to be completed by December 1.

The new forging department of Billings & Spencer Company, Hartford, is in full running order and the 43 hammers make an interesting sight, as well as a large amount of noise. The die sinking department has been improved, and the general facilities increased 20 per cent. They can now furnish the best class of work in large quantities at short notice. Orders are in for considerable amounts of bronze and copper forgings for electrical purposes, and for forgings on government torpedoes.

The Wainwright Manufacturing Company of Massachusetts, have received the following recent orders for their well-known feed water heaters from electric companies: Flackville and Gilberton Electric Light Company, Flackville, Pa., one 100 horse-power feed water heater; Wilmington City Railway Company, Wilmington, Del., one 300 horse-power feed water heater; Liberty Electric Light Company, Liberty, Mo., one 50 horse-power feed water heater; Suburban Electric Light Company, Tacony, Pa., one 200 horse-power feed water heater—this is the third order.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON OCTOBER 13, 1891.

460,942 Trolley catcher for electric cars; Wm. L. Browne, Boston, Mass., assignor of one-half to George E. Costello, same place.
460,958 Electric signals for railway trains; Lawrence Dunn, Fort Smith, Ark.
460,962 Electro-magnetic separator; Gustave M. Gouyard, Leadville, Colo.
460,963 Combined electric clock and thermoscope system; Henry J. Haight, New York, N. Y.
460,967 Track rail for electric street railways; John S. Hill and Bernard Meiring, Cleveland, O.
460,968 Fuse box for electric lamps; Arnold B. Holmes, Boston, and George F. Gale, Winthrop, Mass.
460,972 Rheostat; Otto A. Kessner, Newark, N. J., assignor to the Hanson & Van Winkle Co., of New Jersey.
460,978 Electric soldering iron. 460,979 Electric soda fountain. 460,980 Electric heating core for smoothing irons; Willis Mitchell, Malden, assignor to the Butterfield-Mitchell Electric Heating Co., Boston, Mass.
460,991 Incandescent electric lamp; Albert L. Reinmann, New York, N. Y., assignor to the Westinghouse Electric and Manufacturing Co.
461,023 461,025 461,027 Electric battery. 461,024 Composition for electric batteries. 461,026 Compound for electric batteries and method of preparing the same; Daniel M. Lamb, Boston, Mass.
461,053 Electro-magnetic brake; Alton J. Shaw, Milwaukee, Wis.
461,057 Electric railway; Barton R. Shover and William C. Dickson, Indianapolis, Ind.
461,075 Circuit connector for electric signaling apparatus. 461,076 Electric parlor game; Waldo L. Gates, Springfield, Mass., assignor, by direct and mesne assignments, to Frederick A. Warren, Wilbraham, and Frederick W. Buffington, Springfield, Mass., and the Electric Novelty Advertising Co., of New Jersey.
461,087 Electrical automatic fire extinguisher for buildings; William H. Soley, Philadelphia, Pa.
461,104 Electric signaling apparatus; Eugene G. Mettler, Indianapolis, Ind., assignor, by direct and mesne assignments, of one-half to Frederick L. McGahan, same place, and Henry C. Bailey, Edinburg, Ind.
461,105 Commutator oiler; Fred. L. McGahan, Indianapolis, Ind., assignor, by direct and mesne assignments, of three-fourths to Henry C. Bailey, Edinburg, Ind.
461,122 Electric door operating device; Robertus F. Troy, Madison, Wis.
461,135 Electric inductional transformer; Wm. Stanley, Jr., Pittsfield, Mass.
461,139 System of distributing electric energy; Rankin Kennedy, Glasgow, Scotland.
461,140 Dynamo-electric machine; Rankin Kennedy, Kilmarnock, Scotland.
461,144 Electric arc lamp; Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.
461,152 Telautograph; Max Soblik, Berlin, Germany, assignor to Paul Adolph, same place.
461,169 Non-interfering fire alarm box; Frank S. Loomis, Akron, O.
461,178 Electric boiler alarm; Mathias Beckers, Langerwehe, Germany.
461,194 Signaling switch and circuit; Joseph W. Stover, New York, N. Y.
461,195 Connection for electric conductors; Joseph Dilion, Larchmont, assignor of one-half to H. J. Reilly, New York, N. Y.
461,228 Electric car motor; George Willett, Englewood, Ill.
461,229 Electric meter; George R. Baldwin, New York, N. Y.
461,239 Switch-box; Horatio A. Foster, New York, N. Y., assignor of one-half to John J. Moore, same place.
461,240 Dynamo-electric machine; Ezra T. Gilliland, New York, N. Y.
461,262 Galvanic battery; Philipp Hieronymus, New York, N. Y.
461,271 Electric conductor; Frank A. Perret, Brooklyn, N. Y., assignor to the Elektron Manufacturing Co., same place.
461,279 Watchman's electric time recorder; Fred. W. Schieffer, Buffalo, N. Y.

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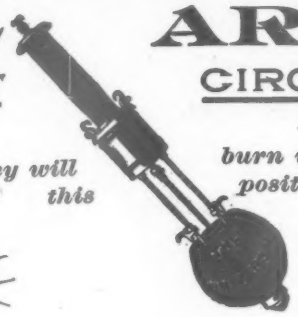

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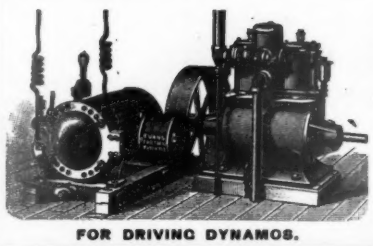

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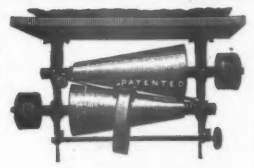

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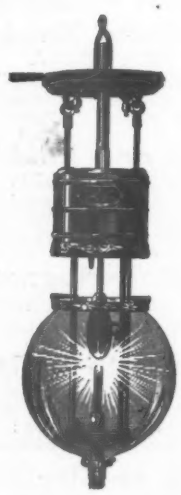

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